

APPENDIX D2: REVISED BDAR

Biodiversity Development Assessment Report

Modification 4 – Western Extension

Cabbage Tree Road Sand Quarry
442 Cabbage Tree Road, Williamtown NSW 2250



Report prepared for:
Williamtown Sand Syndicate Pty Ltd

Version 2.0
13 March 2026

Biodiversity Development Assessment Report

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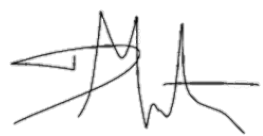
Prepared for:
Williamtown Sand Syndicate Pty Ltd

Prepared by:
Wedgetail Project Consulting Pty Ltd

PO Box 234,
Cardiff NSW 2285
ABN: 93 640 388 683

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).

BAM Assessor	Date of Certification	Signature
David Martin Senior Ecologist (BAAS21021)	13 April 2026 Case Number: 00052110/BAAS24008/24/00052111	

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EXECUTIVE SUMMARY

This Biodiversity Development Assessment Report (BDAR) has been prepared for Williamtown Sand Syndicate Pty Ltd to accompany a modification to the approved Cabbage Tree Road Sand Quarry (SSD-6125) known hereafter as Modification 4 Western Extension (SSD-6125-Mod-4). The proposed modification is located at 398 and 442 Cabbage Tree Road, Williamtown, New South Wales (NSW) (Lot 100/DP 1263921 and Lot 9/DP 239608 respectively) (hereafter “Subject Land”).

Modifications to State Significant Developments (SSDs) trigger entry into the Biodiversity Offset Scheme (BOS) and require the completion of a BDAR. This report has been prepared in accordance with the Biodiversity Assessment Method (BAM) to assess the biodiversity impact and offsetting obligation of the proposal under the *Biodiversity Conservation Act 2016* (BC Act).

The proposed modification to SSD-6125 incorporates elements from the withdrawn Modification 3 (SSD-6125-Mod-3) and seeks the following:

- Extension of the extraction area to the west of the existing sand quarry,
- Expansion of existing road corridors for operational purposes.

The proposed modification is driven by an ongoing high demand for construction materials throughout NSW. Available resources to meet this demand are limited, with no currently operating sources of fully graded, premium quality, construction sand in the Sydney Metropolitan area.

A total of two (2) Plant Community Types (PCTs) occur within the Study Area:

- *PCT 3544: Coastal Sands Apple-Blackbutt Forest*
- *PCT 3996: Coastal Sand Swamp Mahogany Dry Forest*

One (1) non-native vegetation zone (Exotic Grassland) also occurs throughout the Study Area. No Threatened Ecological Communities (TECs) are located within the Study Area.

A total of ten (10) threatened species were identified within the Study Area:

- Squirrel Glider (*Petaurus norfolcensis*) – Species Credit Species recorded at four (4) locations within the Study Area
- Wallum Froglet (*Crinia tinnula*) – Species Credit Species recorded on one (1) occasion within the Study Area
- Mahony’s Toadlet (*Uperoleia mahonyi*) – Species Credit Species recorded at six (6) locations within the Study Area
- *Diuris arenaria* (Sand Doubletail) – Species Credit Species recorded at one (1) location within the Study Area, outside of the Impact Area.
- *Eucalyptus parramattensis* subsp. *decadens* (Earp’s Gum) – Species Credit Species a total of 33 plants were recorded within the Study Area, eleven (11) assumed to be impacted by the proposal

- Southern Myotis (*Myotis macropus*) – Species Credit Species recorded at one (1) Anabat location within the Study Area. No suitable foraging habitat occurs within 200m of the Impact Area
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) – Ecosystem Credit Species recorded at one (1) Anabat location within the Study Area during targeted surveys
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) – Ecosystem Credit Species recorded at one (1) Anabat location within the Study Area during targeted surveys
- Little Bent-winged Bat (*Miniopterus australis*) – Dual Credit Species (Species/Ecosystem) recorded at four (4) Anabat locations within the Study Area during targeted surveys. No suitable roosting habitat occurs within the locality so the species is considered an Ecosystem Credit Species for this assessment
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) – Dual Credit Species (Species/Ecosystem) recorded at three (3) Anabat locations within the Study Area during targeted surveys. No suitable roosting habitat occurs within the locality so the species is considered an Ecosystem Credit Species for this assessment

One (1) additional threatened fauna species was assumed present;

- Koala (*Phascolarctos cinereus*) – suitable foraging habitat for this Species Credit Species occurs within Vegetation Zone 1

Avoidance and impact minimisation measures for the proposed modification prioritise the retention of areas of high environmental values (HEV) identified within the Study Area including:

- Habitat for threatened species, including;
 - Avoidance of all direct impacts to *Diuris arenaria* (Sand Doubletail) and minimisation of impacts to areas of suitable habitat for this SAIL species
 - Avoidance of impacts to areas of suitable habitat for Wallum Froglet (*Crinia tinnula*) and Mahony's Toadlet (*Uperoleia mahonyi*) and minimisation of impacts to species habitat buffers
 - Minimisation of direct impacts to *Eucalyptus parramattensis subsp. decadens* with offset planting proposed within the Study Area (eleven [11] plants)
 - Minimisation of impacts to suitable habitat for Squirrel Glider (*Petaurus norfolcensis*)
 - Minimisation of impacts to suitable habitat for Koala (*Phascolarctos cinereus*)
- Impacts to connectivity have been minimised through the removal of a previously proposed haul road and staging of vegetation clearing and revegetation to maintain a north-south movement corridor connecting habitat within the Study Area with areas to the north.
- Koala habitat assessments were completed in accordance with the Port Stephens Comprehensive Koala Plan of Management (CKPoM), in summary:

- Preliminary Assessment identified the vegetation within the Study Area is mapped as 'Preferred Koala Habitat Link Over Supplementary' or 'Preferred Koala Habitat Link Over Cleared', with large areas of both 'Supplementary Koala Habitat' and 'Preferred Koala Habitat'
 - Vegetation Mapping of the Study Area was completed in accordance with the BAM and CKPoM Guidelines, detailing three (3) Community Survey Categories; *Tall Open Blackbutt and Syd Red Gum F with Scribbly Gum* (Category B), *Cleared* and *Swamp Mahogany variant* (Category A) outside of the Impact Area.
 - Koala Habitat Identification within the Study Area provided a site specific koala habitat map including areas of 'Preferred Koala Habitat' (Study Area: 4.61 ha / Impact Area: 0.74 ha [16%]), 'Preferred Koala Habitat Link Over Cleared Land' (Study Area: 3.41 ha / Impact Area: 2.14 [63%]), and 'preferred Koala Habitat Link Over Other Vegetation' (Study Area: 8.02 ha / Impact Area: 2.88 ha [36%])
 - Assessment of the Proposal was undertaken in accordance with the CKPoM
- Habitat hollows: No HBTs will be impacted as part of the proposed modification
 - Impacts to Groundwater Dependent Ecosystems (GDEs) within the Study Area are avoided through the location of the proposed extraction and limitations on the depth of extraction. Ongoing monitoring of groundwater will occur throughout operation in accordance with the Maximum Excavation Level (MEL) Management Plan.
 - Management of impacts and proposed rehabilitation will be further detailed through amendment of the existing Biodiversity and Rehabilitation Management Plan.

Additional impact mitigation measures are detailed in **Section 5.3** of this report.

A total of three (3) prescribed impacts, as described in Section 8.3 of the BAM 2020, were considered under the proposed modification including:

- Impacts to "*habitat of threatened entities associated with human-made structures or non-native vegetation*" – Existing human-made structures were determined unsuitable roosting habitat for threatened microchiropteran bats. Non-native vegetation (exotic grasslands) were surveyed in accordance with *Surveying threatened plants and their habitats* (DPIE 2020) and determined to not represent habitat for threatened species including *Diuris arenaria* (Sand Doubletail) recorded within the Study Area.
- Impacts to "*connectivity of habitat of threatened entities*" – The proposed modification was amended following correspondence with the NSW DCCEW, including the removal of the northern haul road and the staging of vegetation clearing and rehabilitation to avoid and minimise impacts to connectivity within the Study Area.
- Impacts to "*water quality, bodies and hydrological processes that sustain threatened species or ecological communities*" – The depth of the proposed extraction is to 0.7 m above the maximum predicted groundwater, with the rehabilitated final landform to be 1 m. At this depth the modification will not impact groundwater aquifer, therefore there will not be a drawdown effect on the aquifer which sustains obligate Groundwater Dependent Ecosystems (GDEs)

identified within the Study Area including areas of Swamp Sclerophyll Forest TEC. Considering the depth of the watertable within the Impact Area, the vegetation directly impacted by the proposal is considered to be either facultative or non-GDE communities.

Residual impacts to vegetation is summarised below including originally approved impacts (a), new impacts as part of this modification (b) and impacts reduced as part of this modification (c). Cumulative impacts on each species under the modified SSD are outlined as Total Impacts (d).

Vegetation	(a) Approved Impacts	(b) Modification Impacts (increase)*	(c) Modification Impacts (decrease)	(d) Total Impacts
<i>PCT 3544: Coastal Sands Apple-Blackbutt Forest (Moderate)</i>	18.35	0.74	1.17	17.92
<i>PCT 3544: Coastal Sands Apple-Blackbutt Forest (Shrubby)</i>	2.84	1.46	0	4.30
<i>PCT 3544: Coastal Sands Apple-Blackbutt Forest (Managed)</i>	19.01	0.69	0	19.70
Exotic Grassland	0	1.35	0	1.35
Coastal Sand Wallum Woodland Heath	0.04	0	0	0.04
Swamp Mahogany – Paperbark Swamp Forest	0.13	0	0	0.13
Swamp Mahogany – Paperbark Swamp Forest (Regenerating Vegetation)	0	0	0	0
Coastal Wet Sand Cyperoid Heath	0	0	0	0
Tomago Sand Swamp Heath	0	0	0	0
Tomago Sand Swamp Woodland	0	0	0	0
Cleared Land	1.88	0.92	0	2.8
Total	42.25	5.16	1.17	46.24

*Mod impacts (b) are those to be offset under the proposed modification

Residual impacts to threatened species and their habitats is summarised below including originally approved impacts, new impacts as part of this modification, and impacts reduced as part of this modification. Cumulative impacts on each species under the modified SSD are Total Impacts.

Species	(a) Approved Impacts	(b) Mod Impacts (increase)	(c) Mod Impacts (decrease)	(d) Total Impacts
<i>Diuris arenaria</i> - Sand Doubletail	-*	2.88 ha	0	2.88 ha
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i> - Earp's Gum	230 plants	11 plants	0	241 plants
<i>Crinia tinnula</i> - Wallum Froglet	0.71 ha	0.70 ha	0	1.41 ha
<i>Uperoleia mahonyi</i> - Mahony's Toadlet	0.13 ha**	2.88 ha	0	3.01 ha
<i>Petaurus norfolcensis</i> - Squirrel Glider	40.38 ha	2.18 ha	1.17	41.41ha
<i>Phascolarctos cinereus</i> - Koala	40.38 ha	0.74 ha	1.17	39.95 ha
<i>Eucalyptus camfieldii</i> - Camfield's Stringybark	227 plants	0	8	219 plants

*species was not recorded within the approved impact area

** impacts to "core habitat" differ from current impact calculation requirements (400m buffer from aquatic habitat)

One (1) listed Serious and Irreversible Impacts (SII) entity was recorded within the Study Area during targeted surveys; *Diuris arenaria* (Sand Doubletail). One (1) additional species was considered a potential SII entity, albeit not currently listed by the DCCEE; Mahony's Toadlet (*Uperoleia mahonyi*). SII assessments were completed for SII entities in accordance with Section 2.3 of the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019). The proposal is unlikely to result in a SII for *Diuris arenaria* (Sand Doubletail) as there will not be any direct impacts to individuals (all plants to be retained). The proposal is also unlikely to result in SII for Mahony's Toadlet as direct impacts to core habitat for the species (aquatic habitat) are avoided by the proposal and indirect impacts to groundwater dependent habitat is avoided by restricting the depth of extraction. Connectivity for both of these SII entities for assessment has been retained following amendments to the proposed sand quarry layout, removal of the northern haul road and staging of rehabilitation.

Offsets are required as a result of residual impacts to vegetation and threatened species (and/or their habitat) in accordance with the BAM, including:

- *Coastal Dune Dry Sclerophyll Forests* <50% - **36 credits**
- *Diuris arenaria* (Sand Doubletail) - **71 credits**
- *Eucalyptus parramattensis subsp. decadens* (Earp's Gum) - **22 credits**
- *Crinia tinnula* (Wallum Froglet) - **5 credits**
- *Uperoleia mahonyi* (Mahony's Toadlet) - **48 credits**
- *Petaurus norfolcensis* (Squirrel Glider) - **42 credits**
- *Phascolarctos cinereus* (Koala) - **27 credits**

A total of three (3) threatened species listed under the Commonwealth's *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) will be impacted by the proposed modification including; *Eucalyptus parramattensis subsp. decadens* (Earp's Gum) (vulnerable), Mahony's Toadlet (*Uperoleia mahonyi*) (endangered), and Koala (*Phascolarctos cinereus*) (endangered). Broadly suitable habitat for another three (3) species will also be impacted by the proposed modification, including; New Holland Mouse (*Pseudomys novaehollandiae*), Grey-headed Flying-fox (*Pteropus poliocephalus*), and Swift Parrot (*Lathamus discolor*). An assessment of significance was completed for each species in accordance with the EPBC Act Matters of National Environmental Significance Significant Impact Guidelines 1.1 (see **Section 7.1**). These assessments determined that due to the scale of impacts the proposed modification is unlikely to result in a significant impact to MNES. As such, a referral to the Commonwealth Minister for the Environment is not considered necessary.

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Abbreviations

API	Aerial Photography Imagery
BAM	Biodiversity Assessment Method
BC Act	<i>Biodiversity Conservation Act 2016 (NSW)</i>
BCD	Biodiversity Conservation Division
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offsets Scheme
DPE	NSW Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
DAWE	Commonwealth Department of Agriculture, Water and Environment
DFSI	NSW Department of Finance, Services and Innovation
DPI	NSW Department of Primary Industry
DoEE	Department of the Environment and Energy
EG	Fern Growth
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)</i>
EPIs	environmental planning instruments
EP&A Act	<i>Environmental Planning and Assessment Act 1979 (NSW)</i>
FG	Forb Growth

GG	Grass and grass-like
GIS	Geographic Information System
GPS	Global Positioning System
HBT	Hollow bearing tree
HTW	high threat weed
IBRA	Interim Biogeographic Regionalisation for Australia
ICOLL	Intermittently Closed and Open Lake and Lagoon
KLF	Kleinfelder Australia
LEP	Local Environment Plan
LGA	local government area
LHCCREMS	Lower Hunter Central Coast Regional Environment Strategy
MNES	Matters of National Environmental Significance
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
OG	Other Growth
PCT	plant community type
PMST	Protected Matters Search Tool
RDP	Random Data Point
SAII	Serious and Irreversible Impact
SCA	State Conservation Area
SEPPs	State Environmental Planning Policies
SG	Shrub Growth
SSD	State Significant Development
TBDC	Threatened Biodiversity Data Collection
TEC	threatened ecological community
TG	Tree Growth
VZ	Vegetation Zone
WoNS	Weeds of National Significance
WPC	Wedgetail Project Consulting
WSS	Williamtown Sand Syndicate

1. INTRODUCTION

1.1 SCOPE

Wedgetail Project Consulting (WPC) was engaged by Williamtown Sand Syndicate PTY LTD (WSS) to prepare a Biodiversity Development Application Report (BDAR) as part of a modification (MOD 4) to the approved Cabbage Tree Road Sand Quarry State Significant Development (SSD-6125). WSS are the owners of the quarry operated under the name Newcastle Sand (NS). The proposed modification is located at 398 and 442 Cabbage Tree Road, Williamtown, New South Wales (NSW) (Lot 100/DP 1263921 and Lot 9/DP 239608 respectively) (hereafter “Subject Land”) (**Figure 1**).

The proposed modification seeks to extend the area of resource extraction to the west, into the adjacent property at 442 Cabbage Tree Road (Lot 9/DP 239608) (hereafter referred to as the “Western Extension”). To support this extension and improve access and safety within the existing sand quarry the modification also seeks expansion of approved haul roads within 398 Cabbage Tree Road (Lot 100 /DP 1263921) (“Operational Impacts Area”). Collectively the Western Extension and Operational Impacts Area are hereafter referred to as the “Impact Area” (**Figure 2**).

The following terms are used throughout this report to describe particular geographical areas:

- **Subject Land** – 398 and 442 Cabbage Tree Road, Williamtown, NSW 2318 (Lot 1012 / DP 814078, Lot 11 / DP 629503, Lot 121 / DP 556403, Lot 100 / DP 1263921, and Lot 9 / DP 239608).
- **Approved Quarry:** The area within the Subject Land approved for resource extraction and operational impacts under the original State Significant Development approval (SSD-6125) and impacts approved under modifications to this approval. Impacts to biodiversity values within the Approved Quarry are referred to as “Approved Impacts” within the report.
- **Study Area:** The area of land within the Subject Land assessed as part of this modification.
- **Impact Area:** The area within the Subject Land that will be impacted as a result of the proposed modification to the Approved Quarry including the Western Extension and Operational Impacts Area. Impacts to biodiversity values within the Impact Area are referred to in this report as “Proposed Impacts” in contrast to the “Approved Impacts” defined above.
- **Western Extension:** The area proposed for resource extraction within Lot 9/DP 239608
- **Operational Impacts Area:** The area proposed to be impacted within Lot 100/DP 1263921
- **Avoided Impacts:** Areas previously approved to be impacted sought to be retained under the current modification
- **Locality:** Land within a 5-kilometre (km) radius of the Subject Land.

1.2 SITE DESCRIPTION

The Subject Land is zoned as RU2 “Rural Landscape” under the Port Stephens Local Environmental Plan 2013 (PSLEP 2013). The Subject Land is characterised by large areas of intact native vegetation, exotic managed grassland, rehabilitated native vegetation, and the existing operation area of the Cabbage Tree Road Sand Quarry (**Figure 3**). The Subject Land is surrounded by Tilligerry State Conservation Area to the north, with rural land and large lot residential land users to the east, south and west of the Subject Land.

1.3 THE PROPOSED MODIFICATION

The proposal modification represents the fourth proposed modification to the Cabbage Tree Road Sand Quarry Development (SSD-6125). Cumulatively, the area subject to approved modifications are referred to as the “Approved Quarry” and are shown in **Figure 2**. Previous modifications include:

- Modification 1: Glass Sand Trial – Approved March 2020.
- Modification 2: Addition of wash plant and ancillary equipment – Approved March 2021.
- Modification 3: proposed extension within Lot 100 (Withdrawn).

The proposed modification 4 includes the extension of resource extraction into the adjacent property at 442 Cabbage Tree Road (Lot 9/DP 239608) (“Western Extension”) and expansion of approved haul roads within 398 Cabbage Tree Road (Lot 100 /DP 1263921) to support the Western Extension and improve access and safety within the existing sand quarry (“Operational Impacts”) (**Figure 3**). The proposal also seeks to remove previously approved impact areas (“Avoided Impacts”) so as to include these areas into the Onsite Biodiversity Stewardship Site (**Figure 2**).

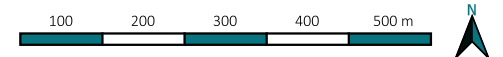
Impacts associated with Modification 4 occur entirely within land previously cleared and dredged for mineral sands in the late 1970’s (see **Figure 7**). The layout of the proposed modification is the product of an iterative process of impact avoidance and minimisation through consultation with the NSW Department of Climate Change, Environment, Energy and Water (DCCEEW). Changes to the proposed layout and associated impacts to biodiversity values are documented in **Section 5.1** and **Section 5.2** of this report, with the most recent amendments to the proposal including the following:

- Removal of northern access road into the Western Extension reducing impacts to native vegetation, habitat connectivity to the north of the Subject Land and avoiding direct impacts to *Diuris arenaria* (Sand Doubletail).
- Reduction of Impact Area within the Western Extension reducing impacts to native vegetation, habitat for threatened species (Mahony’s Toadlet, Wallum Froglet, Squirrel Glider, and *Diuris arenaria*), reduction of direct impacts to *Eucalyptus parramattensis* subsp. *decadens* (Earp’s Gum), and expansion of east-west and north-south movement corridors
- Removal of minor Operational Impacts within Lot 100/DP 1263921
- Staging of clearing between Lot 100/DP 1263921 and the Western Extension to minimise impacts to north-south connectivity

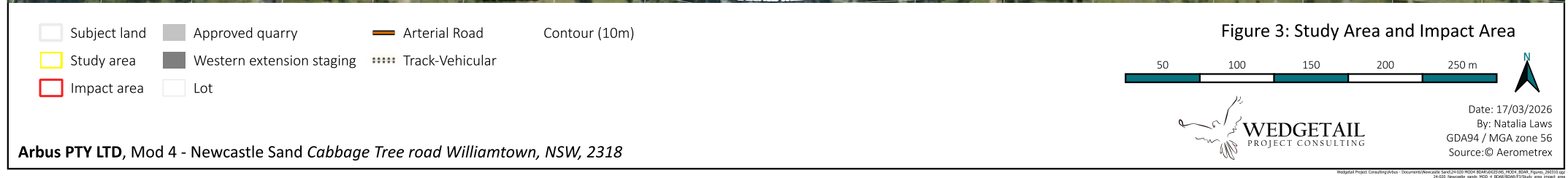


- | | | | |
|--------------|-----------------|--------------------------|-----------------|
| Subject land | Avoided impacts | National Parks & Reserve | Track-Vehicular |
| Study area | Approved quarry | Arterial Road | Contour (10m) |
| Impact area | Lot | Local Road | |

Figure 2: Development to be Modified



Date: 17/03/2026
 By: Natalia Laws
 GDA94 / MGA zone 56
 Source: © Aerometrex



Date: 17/03/2026
By: Natalia Laws
GDA94 / MGA zone 56
Source:© Aerometrex





☐ Subject land

 Avoided impact

Track-Vehicular

Contour (10m)

 Impact area

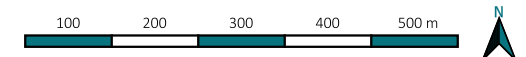
 National Parks & Reserve

— Minor watercourse

■ Approved quarry

== Arterial Road

Figure 4: Avoided Impact



WEDGETAIL
PROJECT CONSULTING

Date: 17/03/2026
By: Natalia Laws
GDA94 / MGA zone 56
Source:© Aerometrex

1.4 INFORMATION SOURCES

The following sources of information were used in to appropriately inform this report:

- The NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), BioNet Atlas (DCCEEW 2025a)
- The Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (PMST) (DCCEEW 2025a) for Matters of National Environmental Significance (MNES)
- State Vegetation Type Map (SVTM), NSW Department of Planning and Environment (2022)
- The NSW DPE BioNet Vegetation Classification Database (DPE 2025)
- The NSW DCCEEW BioNet Threatened Biodiversity Data Collection (DCCEEW 2025b), Threatened Species Profiles (DCCEEW 2025c) and Final Determinations (DCCEEW 2025d)

1.5 LEGISLATIVE CONTEXT

This assessment was undertaken in accordance with the following Acts and Policies:

Commonwealth:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*

New South Wales (NSW):

- *Environmental Planning and Assessment Act 1979 (EP&A Act).*
- *Biodiversity Conservation Act 2016 (BC Act).*
- *Biodiversity Conservation Regulation 2017 (BC Regulation).*
- *Biodiversity Assessment Method (BAM) (DPIE 2020a).*
- *Biosecurity Act 2015.*
- *Coastal Management Act 2016.*
- *Local Land Services Act 2013 (LLS Act).*
- *State Environmental Planning Policy (Biodiversity and Conservation) 2021.*
- *State Environmental Planning Policy (Resilience and Hazards) 2021*
- *Water Management Act 2000 (WM Act)*

Local:

- *Port Stephens Local Environmental Plan 2013*
- *Port Stephens Development Control Plan 2025*
- *Port Stephens Comprehensive Koala Plan of Management (CKPoM)*

1.5.1 Biodiversity Conservation Act 2016 (NSW)

The NSW *Biodiversity Conservation Act 2016* (BC Act), the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation) and amendments to the NSW *Local Land Services Act 2013* (LLS Act) commenced on 25 August 2017. The legislation aims to “maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development”. The BC Act repeals several pre-existing Acts, most notably the NSW *Threatened Species Conservation Act 1995* (TSC), the NSW *Nature Conservation Trust Act 2001* and the NSW *Native Vegetation Act 2003*.

The BC Act together with the BC Regulation outlines the framework for addressing impacts on biodiversity from development and clearing. The framework details a pathway to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offset Scheme (The BOS).

1.1.1.1 Entry into the Biodiversity Offset Scheme

Entry into the BOS is triggered by developments, projects and activities that meet criteria or certain thresholds for significant impacts on biodiversity in accordance with Section 6.3 of the BC Act. Alternatively, the BOS can be entered into on an opt-in basis.

Criteria to which the BOS applies includes the following:

- Local Development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that is likely to significantly affect threatened species. Local development is likely to significantly affect threatened species and require a biodiversity development assessment report (section 7.7 of the Biodiversity Conservation Act 2016) 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
 - are carried out on an Area of Outstanding Biodiversity Value (AOBV)
 - 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 (SSD) and State Significant Infrastructure (SSI) 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”.
- Biodiversity certification proposals.
- Clearing of native vegetation in urban areas and areas zoned for environmental conservation that exceeds the BOS threshold and does not require development consent.
- Clearing of native vegetation that requires approval by the Native Vegetation Panel under the LLS Act.
- Activities assessed and determined under Part 5 of the EP&A Act (generally, proposals by government entities) if proponents choose to ‘opt in’ to the Scheme.

Conclusion

The proposal is a modification to an approved State Significant Development (SSD-6125). As such, entry into the BOS is triggered and a BDAR is required to accompany the MOD Application.

Application of the Biodiversity Offset Scheme

The proposal has been assessed in accordance with the BAM (DPIE 2020a). The Biodiversity Accredited Assessor System (BAAS) Case number for the Project is 00052110/BAAS24008/24/00052111. David Martin (Assessor Number BAAS21021) is the Biodiversity Accredited Assessor for the proposal.

1.5.2 Biodiversity and Conservation SEPP 2021

Chapter 4 - Koala Habitat Protection State Environmental Planning Policy (SEPP 2021)

This Chapter of the Biodiversity and Conservation SEPP incorporates the provisions of the now repealed *State Environmental Planning Policy (Koala Habitat Protection) 2021* (Koala SEPP 2021). The Chapter aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

Chapter 4 applies to each Local Government Area listed in Schedule 2 of the Biodiversity and Conservation SEPP. Where a KPoM applies to the land, Clause 8 of the Koala SEPP 2021 applies to the development. In this case the proposed development must be consistent with the approved KPoM that applies to the land.

Port Stephens LGA is listed in Schedule 2 of the Biodiversity and Conservation SEPP 2021. However, as the Study Area is subject to the approved *Port Stephens Council Comprehensive Koala Plan of Management (CKPoM)* (Port Stephens Council, 2002), any Development Application to Council will need to be consistent with the requirements of the CKPoM.

Port Stephens Comprehensive Koala Plan of Management (CKPoM) 2002

The CKPoM was prepared by Port Stephens Council in accordance with SEPP 44 (now the Biodiversity and Conservation SEPP 2021) and activated by the proposed amending clause of the Port Stephens LEP (Appendix 3). This regulation represents an important means by which koala habitat can be protected and effectively managed. The general aims and objectives of the CKPoM include the following:

- i) *To ensure that the koala population in the Port Stephens LGA is sustainable over the long-term,*
- ii) *To protect koala habitat areas from any development which would compromise habitat quality or integrity,*
- iii) *To ensure that any development within or adjacent to koala habitat areas occurs in an environmentally sensitive manner.*
- iv) *To ensure that acceptable levels of investigation are undertaken, considered and accepted prior to any development in or adjacent to koala habitat areas.*
- v) *To encourage koala habitat rehabilitation and restoration.*
- vi) *Maintain interconnection between areas of Preferred and Supplementary Koala Habitat and minimise threats to safe koala movements between such areas.*
- vii) *To ensure that development does not further fragment habitat areas either through the removal of habitat or habitat links or through the imposition of significant threats to koalas.*

- viii) *To provide guidelines and standards to minimise impacts on koalas during and after development, including any monitoring requirements.*
- ix) *To provide readily understandable advice to proponents preparing development applications and for Council officers involved in the assessment of those applications.*

According to the Guidelines for Koala Habitat Assessments in the PSC CKPoM (2002), to satisfy requirements for a development assessed under Part 4 of the EP&A Act, a Koala Habitat Assessment (Appendix 6) must be carried out by a suitably qualified person (a brief CV should be included for each person involved in the assessment), and include the following for steps:

1. Preliminary Assessment
2. Vegetation Mapping
3. Koala Habitat Identification
4. Assessment of Proposal

See **Section 7.2** for a summary of the Koala habitat assessment.

1.5.3 Biosecurity Act 2015

Under the *Biosecurity Act 2015* (NSW) all plants are regulated with a general biosecurity duty “to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.” Under the Act, a biosecurity impact “is an adverse effect on the economy, environment, or the community that arises, or has the potential to arise, from a biosecurity matter.”

1.5.4 Coastal Management Act 2016

The *Coastal Management Act 2016* replaces the *Coastal Protection Act 1979* and establishes a strategic framework and objectives for managing coastal issues in NSW. The Act promotes a focus on ecologically sustainable development in relation to the ‘coastal zone’ as defined by the Act comprising of four coastal management areas:

- Coastal wetlands and littoral rainforests area – areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
- Coastal vulnerability area – areas subject to coastal hazards such as coastal erosion and tidal inundation.
- Coastal environment area – areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.
- Coastal use area – land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

1.5.5 Resilience and Hazards SEPP 2021

The *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) consolidates, transfers and repeals the provisions of three (3) SEPPs into a single environmental planning instrument, including; the *SEPP (Coastal Management) 2018* (*Coastal*

Management SEPP), *SEPP 33 – Hazardous and Offensive Development (SEPP 33)*, and *SEPP 55 – Remediation of Land (SEPP 55)*. The Resilience and Hazards SEPP aims to promote the protection and improvement of key environmental assets for their intrinsic value and the social and economic benefits they provide. Relevant chapters of the Resilience and Hazards SEPP are considered below:

Chapter 2 – Coastal Management

The aim of this Chapter is to promote an integrated and co-ordinated approach to land use planning in the coastal zone in a manner consistent with the objects of the *Coastal Management Act 2016*, including the management objectives for each coastal management area, by:

- Managing development in the coastal zone and protecting the environmental assets of the coast, and
- Establishing a framework for land use planning to guide decision-making in the coastal zone, and
- Mapping the 4 coastal management areas that comprise the NSW coastal zone for the purpose of the definitions in the *Coastal Management Act 2016*.

The Coastal Management Chapter incorporates the provisions of the now repealed *Coastal Management SEPP* which commenced on 3 April 2018 and consolidated the provisions of: SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection).

The Coastal Management Chapter defines the four coastal management areas in accordance with the *Coastal Management Act* and details mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas. The four coastal management areas are *Coastal wetlands and littoral rainforests area*, *Coastal vulnerability area*, *Coastal environment area*, and *Coastal use area*.

The four coastal management areas are:

- **Coastal wetlands and littoral rainforests area** – areas which display the characteristics of coastal wetlands or littoral rainforests that were previously protected by SEPP 14 and SEPP 26.
- **Coastal vulnerability area** – areas subject to coastal hazards such as coastal erosion and tidal inundation.
- **Coastal environment area** – areas that are characterised by natural coastal features such as beaches, rock platforms, coastal lakes and lagoons and undeveloped headlands. Marine and estuarine waters are also included.
- **Coastal use area** – land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

The Subject Land does not contain areas mapped as any of the four coastal management areas above. As such, the Resilience and Hazards SEPP) and the *Coastal Management Act 2016* does not apply to this development.

1.5.6 Water Management Act 2000

Controlled activities carried out in, on or under waterfront land are regulated by the *Water Management Act 2000* ("WM Act"). 'Waterfront land' is defined as the bed of any river, lake or estuary, and the land within 40 m of the riverbanks, lake shore or estuary mean high water mark. No mapped watercourses occur within the Subject Land. As such, the proposal is unlikely to constitute a 'controlled activity' in accordance with the WM Act. Consideration of impacts to aquatic and riparian habitat is provided in **Section 5**. Mitigation measures are detailed in **Section 5.3**.

1.5.7 Environment Protection and Biodiversity Conservation Act 1999

Under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), an approval is required for actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES). An action includes a project, development, undertaking, activity or series of activities. When a person proposes to take an action, which they believe may need approval under the EPBC Act, they must refer the proposal to the Australian Government Minister for the Environment. The Act identifies the following nine MNES:

1. World Heritage properties.
2. National heritage places.
3. Wetlands of international importance (Ramsar Convention).
4. Listed threatened species and communities.
5. Migratory species listed under international agreements.
6. Great Barrier Reef Marine Park.
7. Commonwealth marine areas.
8. Nuclear actions; and
9. Water resources in respect to CSG and large coal mines.

The proponent is required to address the EPBC Act as part of the proposed modification.

Refer to **Section 7.1** for a summary of the assessment.

1.5.8 Port Stephens Local Environmental Plan 2013

The Subject Land is located within the Port Stephens Local Government Area (LGA). The Port Stephens Local Environmental Plan 2013 (Port Stephens LEP) controls development within the Subject Land through zoning and development controls. These controls are described in greater detail by the supporting Port Stephens Development Control Plan 2025 (Port Stephens DCP).

1.5.9 Port Stephens Council Development Control Plan 2025

The Port Stephens DCP supports the Port Stephens LEP by providing additional detail and guidance on addressing biodiversity issues associated with development. The purpose of the Port Stephens DCP is to provide Council's requirements for sustainable quality development and environmental outcomes within Port Stephens LGA.

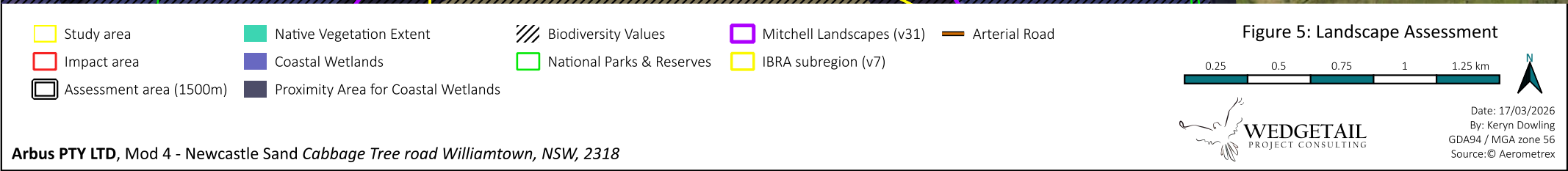
2 SITE CONTEXT

2.1 LANDSCAPE FEATURES

The landscape features detailed in Section 3 of the BAM (DPIE 2020a) and applicable to the Subject Land are described in **Table 1**. These landscape features are also shown on **Figure 5**.

Table 1: Landscape Features relevant to the Subject Land.

Landscape Feature	Summary
IBRA Region	NSW North Coast IBRA Bioregion
IBRA Subregion	Karuah Manning IBRA Sub-region
Local Government Area (LGA)	Port Stephens Council Local Government Area
Mitchell Landscapes	Sydney – Newcastle Barriers and Beaches: (Department of Environment and Climate Change [DECC], 2002; Mitchell 2002).
Rivers, streams and estuaries	No mapped water courses or estuaries occur within the Impact Area.
Wetlands	There are no local or important wetlands within or adjoining to the site. However, Kooragang Nature Reserve a listed RAMSAR Wetland, is within 1 km south of the Subject Land.
Connectivity of different areas of habitat	The Subject Land is part of a larger patch of vegetation in the local area, directly connected to extensive areas of forested habitat within the Tilligerry State Conservation Area (SCA) and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors to local fauna.
Areas of geological significance and soil hazard features	There are no karst, caves, cliffs, rocks or other geological features of significance within the Subject Land.
Areas of outstanding biodiversity value	The Subject Land does not contain an area of “outstanding biodiversity value” (in accordance with Section 3.1.3 of the BAM [DPIE 2020a]).
Geology and Soils	Shoal Bay Variant A This landscape is described as Pleistocene aeolian sandsheets and low dunes composed of quartz sands. Gently inclined sandsheets to elongated, low undulating dunes. Slope gradients generally <15%. Local relief generally <10 m and elevation <15 m. Dunes are usually well drained, but minor swampy areas may occur in depressions. The dunes taper from a broad western end to a fine eastern point.
Native Vegetation Cover	Native vegetation cover was assessed as per Section 3.2 of the BAM 2020 (DPIE 2020a). This 1,500 m site buffer has an area of 996 ha and there is native vegetation cover of 688 ha or 69% (30-70%) (see Figure 5).



3 NATIVE VEGETATION

3.1 METHODOLOGY

Native vegetation within the Subject Land was assessed in accordance with Section 4 of the BAM (DPE 2020a).

3.1.1 Data Review

A total of three (3) vegetation studies were reviewed prior to conducting the vegetation assessment within the Study Area. These studies were used to assist with the stratification of the site into vegetation zones, selection of plot/transect locations and determination of plant community types (PCTs), these included:

- *Vegetation Survey Classification and Mapping Lower Hunter and Central Coast Region* (LHCCREMS; NPWS 2000)
- *State Vegetation Type Mapping C2.0*
- Surveys were undertaken by WPC (2022) as part of a BSSAR and this survey effort was reviewed to inform this report.

Data was also reviewed from previous impact assessments and monitoring reports from compliance activities undertaken across the Subject Land:

- *Ecological Constraints and Opportunities Assessment (RPS 2011)*
- *Ecological Assessment Proposed Sand Quarry, Cabbage Tree Road, Williamtown (Umwelt 2015)*
- *Environmental Impact Assessment: Proposed Sand Quarry, Cabbage Tree Road Summary Report. Kleinfelder (2016).*
- *Newcastle Sand – Annual Amphibian Monitoring. Kleinfelder (2021).*
- *Newcastle Sand – Annual Amphibian Monitoring. Kleinfelder (2022).*

3.1.2 Vegetation Mapping Surveys

Site Assessment

The boundaries of the identified vegetation communities within the Subject Land were mapped using a combination of rapid data points (RDP) and walking transects, using the polygons produced through aerial photo interpretation (API) to assist in targeting survey effort. RDPs involved collecting waypoints over the Subject Land using a handheld Trimble™ GPS unit and recording dominant species, structure and condition. Walking transects involved verifying polygons were homogenous in floristic composition and condition, as well as walking vegetation ecotones and using the recorded tracks to define vegetation community boundaries. The RDPs and survey tracks were then overlaid on an aerial photograph and used to delineate and/or clarify vegetation boundaries.

PCT Determination

Each vegetation community identified within the Subject Land was assigned to the closest equivalent PCT from those listed in the Bionet Vegetation Classification database (DCCEE 2024c). The

closest equivalent PCT for each vegetation community was determined through a comparison of the floristic descriptions of PCTs in the database with the plot/transect data collected from the Subject Land. In addition to floristic and structural similarity, the landscape position, soil type and other diagnostic features of the vegetation communities on the site were compared to the descriptions in the database to determine the most suitable PCT. Threatened ecological communities (TECs) as defined in NSW and Commonwealth legislation were also identified if present.

Vegetation Zones

Vegetation zones were identified and delineated in the Subject Land in accordance with Section 4.3 of the BAM (DCCEEW 2023a). A vegetation zone is defined in the BAM as a relatively homogenous area that is the same vegetation type and broad condition.

Assessing Vegetation Integrity (Site Condition)

Following stratification of the Subject Land into vegetation zones, plots/transects were undertaken to collect site condition data for the composition, structure and function attributes listed in Section 4.3 of the BAM (DPIE 2020a). The location of the plots/transects were selected through stratified random sampling to provide a representative sample of the variation in vegetation composition and condition within each vegetation zone.

The number of plots/transects undertaken across the site meets the minimum number of transects required for each vegetation zone area as detailed in Section 4.3.4, Table 3 of the BAM (DPIE 2020a).

Floristic Identification and Nomenclature

Floristic identification and nomenclature were based on Harden (1992, 1993, 2000 and 2002) with subsequent revisions as published on Plantnet (<http://plantnet.rbgsyd.nsw.gov.au>).

3.2 ASSESSMENT RESULTS

3.2.1 Native Vegetation Extent

A total of 2.88 ha of native vegetation was mapped within the Study Area. The remaining area is characterised as a mix of exotic grassland and existing infrastructure (residential dwelling and sheds).

3.2.2 Vegetation Mapping Results

A total of two (2) PCTs were identified within the Study Area:

- *PCT 3544: Coastal Sands Apple-Blackbutt Forest*
- *PCT 3996: Coastal Sand Swamp Mahogany Dry Forest*

Of these, only one PCT occurs within the proposed Impact Area, *PCT 3544: Coastal Sands Apple-Blackbutt Forest*. This PCT was assigned to a total of three (3) vegetation zones based on variation in management, condition, structure and floristics. Vegetation zones are listed in **Table 2** below. Full descriptions of each vegetation zone are provided in the following sub-sections. Floristic and structural plot data is provided in **Appendix 9**.

Table 2: Vegetation Communities and vegetation zones within the Impact Area

Plant Community Type	Vegetation Zone	Condition Class	Status	Impact Area (ha)
<i>PCT 3544: Coastal Sands Apple-Blackbutt Forest</i>	Veg Zone 1	Moderate	N/A	0.74
	Veg Zone 2	Shrubby regrowth	N/A	1.46
	Veg Zone 3	Managed	N/A	0.69
Exotic Grassland	N/A	N/A	N/A	1.35
Existing Infrastructure and Tracks	N/A	N/A	N/A	0.92
Subject Land Total				5.16

PCT 3544: Coastal Sands Apple-Blackbutt Forest



Plate 1: PCT 3544: Coastal Sands Apple-Blackbutt Forest (Moderate)

Vegetation Community Structure

Vegetation Formation: Dry Sclerophyll Forest (Shrubby sub-formation)

Vegetation Class: Coastal Dune Dry Sclerophyll Forest

Floristic Description

This is the most dominant vegetation community within the Study Area and the only PCT within the Impact Area. The vegetation community is represented by three (3) vegetation zones with variable condition and floristic composition, however, in its intact form (Vegetation Zone 1) the community is characterised by an open canopy of *Angophora costata* (Smooth-barked Apple) and *Eucalyptus pilularis* (Blackbutt) dominating with *Corymbia gummifera* (Red Bloodwood), and *Eucalyptus haemastoma* (Scribbly Gum) occurring throughout. Scattered occurrences of other canopy species included *Eucalyptus parramattensis* subsp. *decadens* (Earp's Gum), and *Eucalyptus capitellata* (Brown Stringybark). The midstorey is dominated by *Leptospermum polygalifolium* (Tantoon), *Acacia longifolia* (Sydney Golden Wattle), and *Banksia serrata* (Old Man Banksia). The shrub layer is dominated by *Monotoca elliptica* (Tree Broom-heath) and *Acacia longifolia* with occurrences of *Bossiaea heterophylla* (Variable Bossiaea), *Acacia ulicifolia* (Prickly Moses), *Daviesia ulicifolia* (Gorse Bitter Pea), *Persoonia levis* (Broad-leaved Geebung), *Aotus ericoides* (Common Aotus),

Ricinocarpos pinifolius (Wedding Bush), *Pimelea linifolia* (Slender Rice Flower), *Persoonia lanceolata* (Lance Leaf Geebung), *Myoporum acuminatum* (Boobialla), *Leptospermum polygalifolium* (Tantoon), and *Euryomyrtus ramosissima* (Rosy Baeckea). The groundcover is dominated by *Pteridium esculentum* (Bracken), *Dianella caerulea* var. *producta* (Blue Flax-lily), and *Pomax umbellata*. The climbing species *Pandorea pandorana* (Wonga Wonga Vine) and *Parsonsia straminea* (Common Silkpod) occur at a low density throughout.

Geology/Soil Landscapes

The vegetation occurs on the Tea Gardens (tn) soil landscape, associated with Pleistocene beach ridges and sandsheets consisting of marine and aeolian quartz sands.

Community Determination

The structure of this community, being a Eucalypts canopy over a dense shrubby understorey, places it within the Dry Sclerophyll Forest (Shrubby Sub-formation) Vegetation Formation. As the community occurs within the coastal sandsheets and dune system it falls within the Coastal Dune Dry Sclerophyll Forest Vegetation Class. A search of the VIS Database using the criteria of the Karuah-Manning IBRA Sub-region, Coastal Dune Dry Sclerophyll Forest Vegetation Class, *Angophora costata*, *Eucalyptus pilularis* and *Corymbia gummiifera* returned three PCTs; 3544, 3545, 3549, 3546 and 3555.

PCT 3545 and 3555 were excluded based on species composition, they were lacking many of the dominant species within the community.

PCT 3545 and 3549 were both a close fit. However, the position in the landscape and locality, along with species composition was all a better fit with PCT3544 when the three PCTs were compared.

Vegetation Conditions within the Subject Land

This vegetation community is represented by a total of three (3) vegetation zones based on condition and/or management. A description of each vegetation zone and areas within the Impact Area is provided in **Table 3** below. The location of each vegetation zone is illustrated in **Figure 6**.

Table 3: PCT 3544: Coastal Blackbutt-Apple Forest vegetation zones

Plant Community Type (PCT)	Vegetation Zone	Condition	Description	Impact Area (ha)	Study Area (ha)
<i>PCT 3544: Coastal Blackbutt-Apple Forest</i>	Vegetation Zone 1	Moderate Condition	Regenerative native canopy, midstory and groundcover and low exotic species cover (Plate 1).	0.74	4.61
	Vegetation Zone 2	Shrubby Regen	Partially intact native canopy, variable native midstory and groundcover influenced by adjacent cleared areas / historical clearing and narrow patch layout. Minimal exotics (see Plate 2).	1.46	1.97
	Vegetation Zone 3	Managed	Partially intact native canopy with managed/cleared midstory and predominantly exotic managed groundcover. Often occurring as paddock trees or windbreaks (Plate 3)	0.69	1.44
Total Area				2.89	8.02

Associated Threatened Ecological Communities (TECs)

No threatened ecological communities listed under the New South Wales (NSW) Biodiversity Conservation Act (BC Act) 2016 or Commonwealth's Environment Protection Biodiversity Conservation Act (EPBC Act) 1999 are associated with PCT 3544.



Plate 2: Vegetation Zone 2: PCT 3544 (Shrubby Regen)



Plate 3: Vegetation Zone 3: PCT 3544 (Managed)

Exotic Grassland



A plot (Q4) was conducted within the exotic grassland to determine the percentage of native and exotic species within this area of the Study Area. This vegetation was characterised as having an exotic groundcover of 87%, dominated by *Eragrostis curvula* (African Lovegrass). As such the vegetation was considered **Exotic Grassland** as it is commensurate with non-native vegetation, low-conservation grasslands, and grasslands permitted to be cleared as defined by the legislation and guidelines listed in **Table 4**. Prescribed impacts and impacts not requiring offsets are considered for this vegetation zone in **Section 5.2.1.3**

Table 4: Exotic Grassland Determination

Reference	Benchmarks	Subject Land	Determination
NSW Biodiversity Offset Scheme Grassland Thresholds (2022)	"In derived plant communities with 100% groundcover that is partially exotic, the area of native vegetation can be calculated to account for the exotic component as follows: a) >75% native is assessed as 100% native, b) between 15-75% native multiply to proportion of native cover by the total area to calculate native vegetation extent, c) Less than 15% native is excluded as native vegetation extent and assessed as non-native vegetation"	A plot (Q4) was conducted within the exotic grassland to determine the percentage of native and exotic species within this area of the Study Area. This vegetation was characterised as having an exotic groundcover of 87%, dominated by	In accordance with the NSW Biodiversity Offset Scheme Grassland Thresholds (2022) the grassland is excluded as native vegetation and assessed as non-native vegetation

Reference	Benchmarks	Subject Land	Determination
		<i>Eragrostis curvula</i> (African Lovegrass).	
<i>Local Land Services Act 2013</i>	For the purposes of this Part, an area is taken, during the transitional period, to be low conservation value grasslands if it comprises only groundcover whose clearing was permitted by section 20 of the Native Vegetation Act 2003, as in force immediately before the repeal of that Act.	N/A	See Native Vegetation Act 2003 below
<i>Native Vegetation Act 2003</i> (Repealed)	"The clearing of native vegetation that comprises only groundcover is permitted if: a) The vegetation comprises less than 50% of indigenous species of vegetation , and b) not less than 10% of the area is covered with vegetation (whether dead or alive), and c) those percentages are calculated in accordance with the regulations."	The grassland was characterised as being 87% exotic, therefore 13% native groundcover species.	Permitted clearing
<i>Land Management (Native Vegetation) Code 2018</i>	Section 69 Permitted clearing of native vegetation (1) This Division authorises clearing of native vegetation that consists only of groundcover if— a) less than 50% of the vegetation cover in the treatment area is comprised of native species of vegetation, and b) not less than 10% of the treatment area is covered with vegetation (whether dead or alive).	The grassland was characterised as being 87% exotic, therefore 13% native groundcover species.	Low Conservation Grassland

3.2.3 Threatened Ecological Community Determination

No threatened ecological communities listed under the BC Act or the EPBC Act were identified within the Impact Area.

3.2.4 Assessment of Patch Size

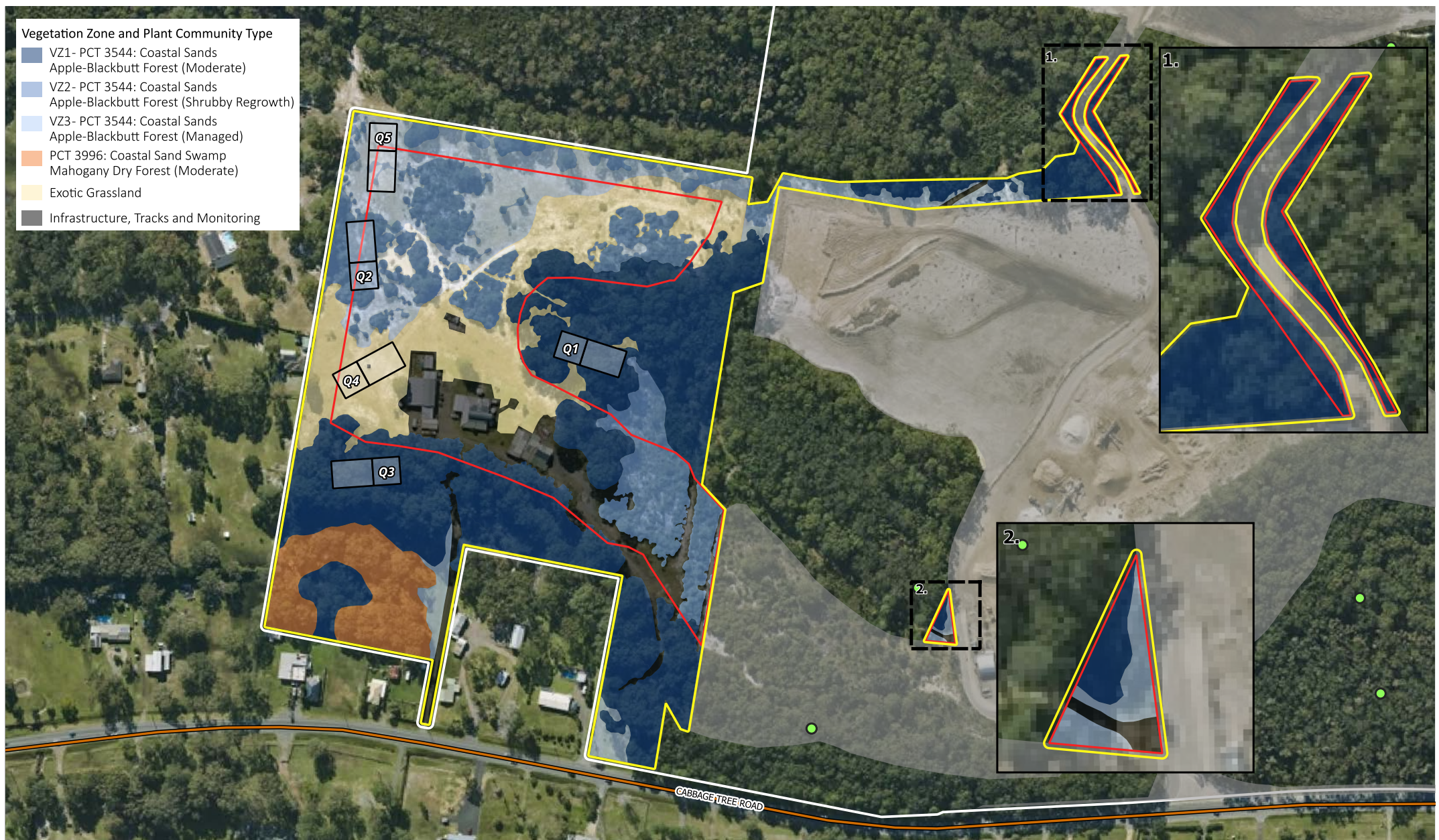
The patch size for all vegetation zones within the Impact Area was assessed as >100 ha as this vegetation is connected to larger intact areas of native forest vegetation extending to the north and west. Any gaps in the connective vegetation considered for the patch sizes are less than 100 m (appropriate for woody vegetation).

3.2.5 Vegetation Integrity Score

The current vegetation integrity scores of the vegetation zones located within the Impact Area are outlined in **Table 5**.

Table 5: Current vegetation integrity score for the vegetation zones

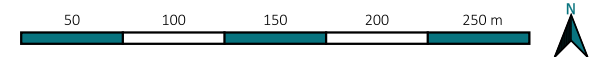
Zone	PCT	Condition class	Area (ha)*	Condition scores (Current Score)			Vegetation integrity score
				Composition	Structure	Function	
1	3544	Moderate Condition	0.74	71	68.7	78.1	72.5
2	3544	Shrubby Regen	1.46	64.5	7.2	17.2	20
3	3544	Managed	0.69	50	24.5	4.4	17.5



- Vegetation Zone and Plant Community Type**
- VZ1- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Moderate)
 - VZ2- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Shrubby Regrowth)
 - VZ3- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Managed)
 - PCT 3996: Coastal Sand Swamp Mahogany Dry Forest (Moderate)
 - Exotic Grassland
 - Infrastructure, Tracks and Monitoring

- Subject land
- Impact area
- Vegetation rapid data point
- Arterial Road
- Study area
- Approved quarry
- Plot / transect
- Contour (10m)

Figure 6: Plant Community Types, Vegetation Zones and Plot Transect Locations



Date: 17/03/2026
By: Natalia Laws
GDA94 / MGA zone 56
Source: © Aerometrex

4. THREATENED SPECIES

4.1 ASSESSING HABITAT SUITABILITY

To inform the assessment of suitable habitat for threatened species and populations within the Study Area, a database search of the NSW Office of Environment and Heritage (OEH) Bionet Atlas (OEH 2024a) and the Commonwealth DCCEEW Protected Matters Search Tool (PMST) (DCCEEW 2023a) were conducted. Results of the database search and 'likelihood of occurrence' assessment has been provided in **Appendix 1**.

4.1.1 Habitat Assessment

4.1.1.1 Flora

The vegetation within the Study Area is characterised as regenerating native vegetation, with open areas of exotic grassland. More intact areas of native vegetation within the Study Area is considered marginally suitable habitat for locally occurring threatened species including *Eucalyptus parramattensis* subsp. *parramattensis* (Earp's Gum) and *Diuris arenaria* (Sand Doubletail).

4.1.1.2 Fauna

Vegetation within the Study Area represents broadly suitable foraging habitat for several locally occurring threatened species including Squirrel Glider (*Petaurus norfolcensis*) and Grey-headed Flying-fox (*Pteropus poliocephalus*). Wetter areas of the Study Area represent suitable habitat for threatened frogs known to occur within the broader Study Area including; Wallum Froglet (*Crinia tinnula*) and Mahony's Toadlet (*Uperoleia mahonyi*).

A habitat assessment was completed in accordance with the '*Species credit threatened bats and their habitats – NSW guide for the Biodiversity Assessment Method*' in order to identify listed habitat constraints and determine the presence of "potential habitat" as defined in the guidelines. This habitat assessment determined the following:

- **Eastern Cave Bat (*Vespadelus troughtoni*)** - Potential habitat is defined as "*all areas with the PCTs associated with the species (as per the TBDC) on the subject land where the subject land is within 2 kilometres of caves, scarps, cliffs, rock overhangs and disused mines*". While both PCTs within the Study Area are linked to the species, there are no caves, cliffs, rock overhangs or disused mines within 2km of the Subject Land.
- **Large-eared Pied Bat (*Chalinolobus dwyeri*)** - Potential habitat is defined as "*all areas with the PCTs associated with the species (as per the TBDC) on the subject land where the subject land is within 2 kilometres of caves, scarps, cliffs, rock overhangs and disused mines*". While both PCTs within the Study Area are linked to the species, there are no caves, cliffs, rock overhangs or disused mines within 2km of the Subject Land
- **Eastern bent-winged bat (*Miniopterus orianae oceanensis*)** - Potential habitat is defined as "*Caves, tunnels, mines or other structures known or suspected to be used by M. orianae oceanensis including species records in the NSW BioNet Atlas with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature. All breeding habitat including the cave, or other features used for breeding, and the area immediately surrounding this feature*". There are no caves, tunnels,

mines, or other structures known or suspected to be used by *M. orianae oceanensis* including species records in BioNet as above within 100m of the Study Area.

- **Little bent-winged bat (*Miniopterus australis*)** - Potential habitat is defined as “Caves, tunnels, mines or other structures known or suspected to be used by *M. australis* including species records in the NSW BioNet Atlas with microhabitat code ‘IC – in cave’; observation type code ‘E nest-roost’; with numbers of individuals >500; or from the scientific literature. All breeding habitat including the cave, or other features used for breeding, and the area immediately surrounding this feature”. There are no caves, tunnels, mines, or other structures known or suspected to be used by *M. australis* including species records in BioNet as above within 100m of the Study Area.
- **Southern Myotis (*Myotis macropus*)** - Potential habitat is defined as “all PCTs associated with the species (as per the TBDC) within 200 metres of the bank of any medium to large permanent creeks, rivers, lakes or other waterways (i.e. with pools/ stretches 3 metres or wider) on the subject land (Anderson et al. 2005)”. There are no areas of open water (>3m wide) within 200m of the Study Area.

As abandoned buildings can represent potential roosting habitat for some locally occurring microbats, old sheds present within the Study Area were all inspected by an experienced fauna ecologist. These buildings were not considered suitable roosting habitat as all cavities were sealed.

A habitat tree survey was undertaken on October 2022, 30 November 2023 and May 2024 to locate hollow-bearing trees, and dead stags. Hollow sizes were defined as small (<8 cm diameter), medium (8 – 20 cm diameter) and large (>20 cm diameter). The location of Habitat Trees and the type of feature it contained was recorded using a handheld GPS. Other potential habitat features such as medium to large stick nests were also surveyed for.

A total of six (6) hollow-bearing trees were recorded within the Study Area, all of which are outside of the Impact Area (**Figure 8**).

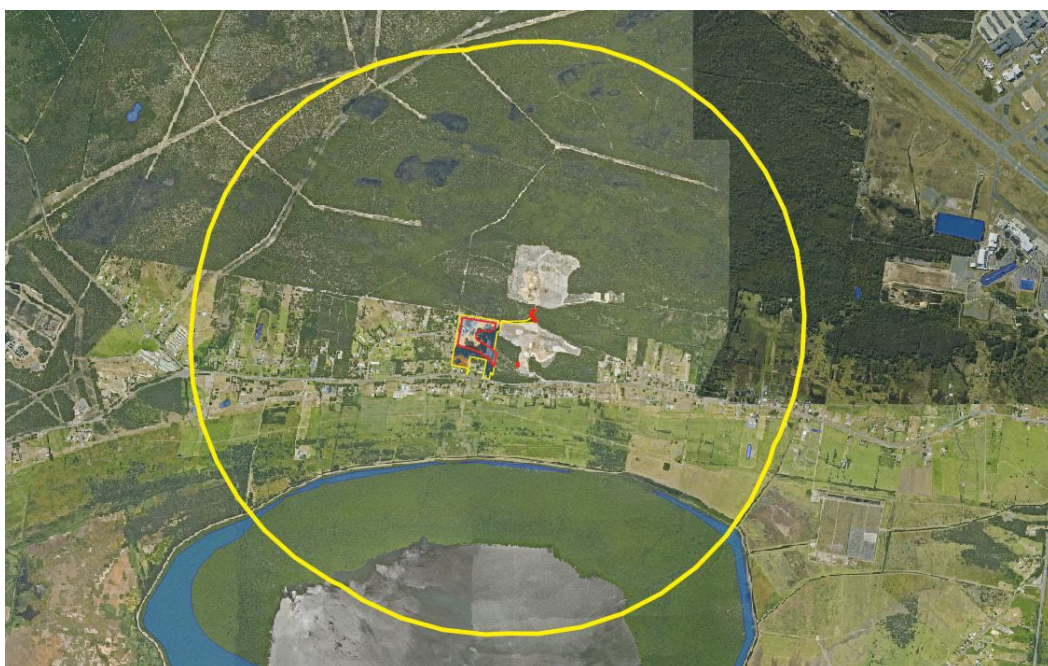


Plate 4: 2km Microbat Habitat Assessment Area

Koala Habitat Assessment

Habitat for the Koala (*Phascolarctos cinereus*) is highly variable across the species' broad geographic range spanning coastal and inland areas from far-north Queensland to the south-east corner of South Australia. Koala habitat suitability is regionally variable and influenced by the availability and nutritional quality of food trees, presence of suitable resting trees and microclimates, age structure of habitat, management history, and barriers to dispersal (DAWE 2021).

An assessment of koala habitat suitability within the Subject Land in accordance with Chapter 5 of the BAM (DPE 2020) is provided below. Key guidelines and resources used to inform the koala habitat assessment include the following:

- **BAM Guidelines** - the *Department of Planning and Environment Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide* (DPE 2022) (i.e. the BAM Guideline),
- **Port Stephens Comprehensive Koala Plan of Management (CKPoM):** Assessment in accordance with the CKPoM is provided in **Section 7.2**.

An assessment of koala habitat suitability in accordance with the BAM Guidelines is provided below.

BAM Guidelines

Suitable habitat is defined under the BAM Guideline as “*habitat where the target species is expected to occur or periodically use. It identifies the area where a targeted survey is required on the subject land*”. Suitable habitat is identified as “*any PCT associated with koala in the TBDC, and with a minimum of one koala use tree present, for the relevant region*”. For the purposes of the BAM Guideline koala use trees are listed in Appendix C of the guide and include tree species used by koalas for food and shelter across nine Koala Modelling Regions in NSW (DPIE 2019).

- The Subject Land is located within the Central Coast Koala Modelling Region
- One (1) PCT within the Impact Area is associated with the koala in the TBDC, *PCT 3544: Coastal Sands Apple-Blackbutt Forest* (Vegetation Zones 1, 2 and 3)
- Vegetation Zones 1 and 2 contain a total of seven (7) koala use trees as listed in Appendix C of the BAM Guidelines, these include: *Allocasuarina littoralis* (Black She-Oak), *Angophora costata* (Sydney Red Gum), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus haemastoma* (Broad-leaved Scribbly Gum), *Eucalyptus parramattensis* (Parramatta Red Gum), *Eucalyptus pilularis* (Blackbutt), and *Eucalyptus robusta* (Swamp Mahogany)
- As such, Vegetation Zones 1 and 2 are considered Suitable Habitat for the koala in accordance with the BAM Guideline. Koala records occur within the locality, as such targeted surveys were completed in accordance with the BAM Guideline, and are detailed in **Section 4.2.2.1**.

4.1.2 Ecosystem Credit Species

The following assessment of habitat suitability for ecosystem credit species was conducted in accordance with Section 6.2 of the BAM. Ecosystem credits represent threatened species that can be predicted to be present by the type and condition of vegetation at the Impact Area. Targeted surveys are not required for ecosystem credit species.

Step 1: Identify threatened species for assessment

A list of predicted ecosystem credit species for the Impact Area was reviewed in the BAM calculator, according to PCTs present on the Impact Area. Predicted Species Report is within **Appendix 4**.

Step 2: Assessment of the habitat constraints and vagrant species

The potential for identified ecosystem credit species to occur on the Impact Area was assessed according to species specific habitat requirements, as detailed in **Table 6**. Where habitat features were not present due to the degraded condition of the site vegetation, ecosystem credit species were excluded as a predicted species.

Table 6: Assessment of ecosystem credit species within the Impact Area.

Scientific name	Common name	Confirmed Predicted Species	Justification
<i>Anthochaera phrygia</i>	Regent Honeyeater	Yes	-
<i>Artamus cyanopterus cyanopterus</i>	Dusky Woodswallow	Yes	-
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	Yes	-
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo	Yes	-
<i>Chthonicola sagittata</i>	Speckled Warbler	Yes	-
<i>Circus assimilis</i>	Spotted Harrier	Yes	-
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Yes	-
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Yes	-
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	Yes	-
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	Yes	-
<i>Esacus magnirostris</i>	Beach Stone-curlew	Yes	-
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	Yes	-
<i>Glossopsitta pusilla</i>	Little Lorikeet	Yes	-
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Yes	-
<i>Hieraaetus morphnoides</i>	Little Eagle	Yes	-
<i>Hirundapus caudacutus</i>	White-throated Needletail	Yes	-
<i>Lathamus discolor</i>	Swift Parrot	Yes	-
<i>Lophoictinia isura</i>	Square-tailed Kite	Yes	-
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	Yes	-
<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	Yes	-
<i>Miniopterus australis</i>	Little Bent-winged Bat	Yes	-

Scientific name	Common name	Confirmed Predicted Species	Justification
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	Yes	-
<i>Neophema pulchella</i>	Turquoise Parrot	Yes	-
<i>Pandion cristatus</i>	Eastern Osprey	Yes	-
<i>Petaurus australis</i>	Yellow-bellied Glider	Yes	-
<i>Petroica boodang</i>	Scarlet Robin	Yes	-
<i>Phoniscus papuensis</i>	Golden-tipped Bat	Yes	-
<i>Pomatostomus temporalis</i>	Grey-crowned Babbler (eastern subspecies)	Yes	-
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	Yes	-
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Yes	-
<i>Ptilinopus superbus</i>	Superb Fruit-Dove	Yes	-
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	Yes	-
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	Yes	-
<i>Stagonopleura guttata</i>	Diamond Firetail	Yes	-
<i>Syconycteris australis</i>	Common Blossom-bat	Yes	-

4.1.3 Species Credit Species

Step 1: Identify threatened species for assessment.

A preliminary list of Candidate Species Credit species for the Impact Area was reviewed in the BAM calculator. Species credits pertain to threatened species that cannot be reliably predicted by the vegetation present. The Candidate Species Report is detailed within **Appendix 4**.

Step 2: Assessment of the habitat constraints and vagrant species

The potential for identified species credit species to occur on the Impact Area was assessed according to species specific habitat requirements. The list of candidate species and justification for any exclusion is provided in **Table 7**.

Step 3: Identify candidate species credit species for further assessment.

No further assessment is required for species excluded as candidate species listed in **Table 7**.

Table 7: Species credit species and justification for inclusion as candidate species.

Scientific name	Common name	Confirmed Candidate Species	Justification
<i>Aepyprymnus rufescens</i>	Rufous Bettong	No	Geographic Constraint - Not "North of Gloucester"
<i>Allocasuarina simulans</i>	Nabiak Casuarina	Yes	-
<i>Angophora inopina</i>	Charmhaven Apple	Yes	-
<i>Anthochaera phrygia</i>	Regent Honeyeater	No	Habitat Constraints - "As per Important Habitat map"
<i>Asperula asthenes</i>	Trailing Woodruff	Yes	-

Scientific name	Common name	Confirmed Candidate Species	Justification
<i>Burhinus grallarius</i>	Bush Stone-curlew	Yes	-
<i>Callistemon linearifolius</i>	Netted Bottle Brush	Yes	-
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	No	Habitat Constraints – no “Hollow bearing trees” or “Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger”
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo	No	Habitat Constraints – no “Hollow bearing trees” or “Living or dead tree with hollows greater than 15cm diameter and higher than 8m above ground”
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Yes	-
<i>Commersonia prostrata</i>	Dwarf Kerrawang	Yes	-
<i>Corybas dowlingii</i>	Red Helmet Orchid	Yes	-
<i>Crinia tinnula</i>	Wallum Froglet	Yes	-
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	Yes	-
<i>Cynanchum elegans</i>	White-flowered Wax Plant	Yes	-
<i>Diuris arenaria</i>	Sand Doubletail	Yes	-
<i>Diuris praecox</i>	Rough Doubletail	Yes	-
<i>Dromaius novaehollandiae</i> - endangered population	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	Yes	-
<i>Esacus magnirostris</i>	Beach Stone-curlew	Yes	-
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	Yes	-
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	Eucalyptus parramattensis subsp. <i>decadens</i>	Yes	-
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	Yes	-
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	No	Habitat Constraints – No “Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines”
<i>Hieraaetus morphnoides</i>	Little Eagle	No	Habitat Constraints – No “Nest trees - live (occasionally dead) large old trees within vegetation)”
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	Yes	-
<i>Lathamus discolor</i>	Swift Parrot	No	Habitat Constraints - “As per Important Habitat map”
<i>Lindernia alsinoides</i>	Noah's False Chickweed	Yes	-

Scientific name	Common name	Confirmed Candidate Species	Justification
<i>Litoria aurea</i>	Green and Golden Bell Frog	Yes	
<i>Lophoictinia isura</i>	Square-tailed Kite	No	Habitat Constraints – no “Nest Trees”
<i>Miniopterus australis</i>	Little Bent-winged Bat	No	Habitat Constraints – no “Caves”, or “Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding 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”
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	No	Habitat Constraints – no “Caves”, “Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code “IC - in cave” observation type code “E nest-roost” with numbers of individuals >500”
<i>Myotis macropus</i>	Southern Myotis	No	Habitat Constraints – no “Waterbodies”, or “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”
<i>Ninox connivens</i>	Barking Owl	No	Habitat Constraints – no “Hollow bearing trees” or “a living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground”
<i>Ninox strenua</i>	Powerful Owl	No	Habitat Constraints – no “Hollow bearing trees” or “a living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground”
<i>Pandion cristatus</i>	Eastern Osprey	No	Habitat Constraints – no “Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting)”
<i>Petauroides volans</i>	Southern Greater Glider	Yes	-
<i>Petaurus norfolcensis</i>	Squirrel Glider	Yes	-

Scientific name	Common name	Confirmed Candidate Species	Justification
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	No	Habitat Constraints – no “Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines”
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Yes	-
<i>Phascolarctos cinereus</i>	Koala	Yes	-
<i>Planigale maculata</i>	Common Planigale	Yes	-
<i>Potorous tridactylus</i>	Long-nosed Potoroo	Yes	-
<i>Prostanthera densa</i>	Villous Mint-bush	Yes	-
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	No	Habitat Constraints – no “Breeding Camps”
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	Yes	-
<i>Rhizanthella slateri</i> - endangered population	<i>Rhizanthella slateri</i> (Rupp) M.A. Clem. & Cribb in the Great Lakes local government area	No	Geographic Limitation – not “within the former Great Lakes LGA, now Mid Coast Council LGA”
<i>Rhodomyrtus psidioides</i>	Native Guava	Yes	-
<i>Senecio spathulatus</i>	Coast Groundsel	No	Habitat Constraints – not located on “Headlands within 500 m of the coast”
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	Yes	-
<i>Tetradlea juncea</i>	Black-eyed Susan	Yes	-
<i>Tyto novaehollandiae</i>	Masked Owl	No	Habitat Constraints – no “Hollow bearing trees” or “a living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground”
<i>Uperoleia mahonyi</i>	Mahony's Toadlet	Yes	-
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	No	Habitat Constraints – no “Caves” or “within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds”

4.2 THREATENED SPECIES SURVEYS

Step 4: Determine presence or absence of candidate species credit species.

4.2.1 Candidate Flora Surveys

Candidate threatened flora species were surveyed for in accordance with the *Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020h). Targeted threatened flora surveys were conducted across the Study Area. All surveys were conducted using systematic parallel transects. Parallel field traverses were separated by 5 to 10 m for orchids, herbs and forbs, 10 to 15 m for sub-shrubs, and 10 to 20 m for species in all other life forms (shrubs and trees).

Survey requirements and timing for each candidate species is detailed in **Table 8**.

4.2.1.1 Flora Survey Results

A total of 65 flora species were identified during field surveys, seven (7) of these were exotic species, of which two (2) are considered 'High Threat Exotics' and two (2) are listed Priority Weeds for the Greater Sydney Local Land Services Region under the *Biosecurity Act 2015* (NSW).

A total of two (2) threatened flora species were identified within the Study Area during field surveys;

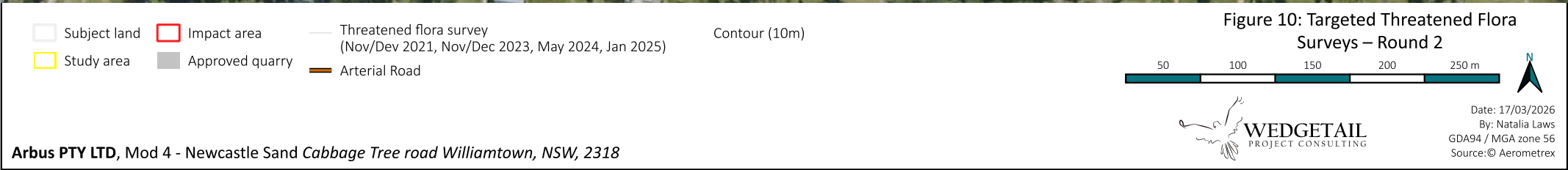
- ***Diuris arenaria* (Sand Doubletail)** – One (1) individual was recorded within the Study Area. Following amendments to the proposed Impact Area no individuals occur within the Impact Area.
- ***Eucalyptus parramattensis* subsp. *parramattensis* (Earp's Gum)** – A total of 32 individuals were recorded within the Study Area. A total of nine (9) individuals of this species occur within the proposed Impact Area.

Table 8: Candidate Threatened Flora Species Credit Species

Scientific Name Common Name	Species Presence	Survey Method	Survey Timing			Conclusion	
			TBDC	Western Ext.	Op. Impacts Area		
Flora							
<i>Commersonia prostrata</i> Dwarf Kerrawang	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	All year	Round 1 18 th October 2023 and 13 th May 2024	-	Species not detected; No further assessment required	Round 1
<i>Grevillea parviflora</i> subsp. <i>parviflora</i> Small-flower Grevillea	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	August to November	Round 1 18 th of October 2023 and 2 nd Sept, 2024	Round 1 3 rd December 2021	Species not detected; No further assessment required	
<i>Rhizanthella slateri</i> Eastern Australian Underground Orchid	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	All year	Round 1 18 th of October 2023, and 2 nd Sept, 2024	Round 1 21 & 22 October 2021	Species not detected; No further assessment required	
<i>Tetradlea juncea</i> Black-eyed Susan	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	October to November	Round 1 18 th October 2023 and 2 nd Sept, 2024	Round 1 21 & 22 October 2021	Species not detected; No further assessment required	
<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	November to January	Round 2 8 th of November 2023 28 th of January, 2025	Round 2 4 & 5 November 2021	Species not detected; No further assessment required	Round 2
<i>Cynanchum elegans</i> White-flowered Wax Plant	No (Surveyed)	Parallel traverses at 5-10 m intervals across all areas of habitat.	All year	Round 2 18 th of October 2023 and 13 th of May 2024	-	Species not detected; No further assessment required	
<i>Lindernia alsinoides</i> Noah's False Chickweed	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat	November to February	Round 2 8 th of November	No suitable habitat	Species not detected; No further assessment required	
<i>Prostanthera densa</i> Villous Mint-bush	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	All year	Round 2 8 th of November 2023 and 13 th May 2024	Round 2 3 rd December 2021	Species not detected; No further assessment required	

Scientific Name Common Name	Species Presence	Survey Method	Survey Timing			Conclusion	
			TBDC	Western Ext.	Op. Impacts Area		
<i>Allocasuarina simulans</i> Nabiac Casuarina	No (Surveyed)	Parallel traverses at 10-20 m intervals across all areas of habitat.	All year	Round 3 8 th of November 2023, and 13 th May 2024	Round 3 3 rd December 2021	Species not detected; No further assessment required	Round 3
<i>Asperula asthenes</i> Trailing Woodruff	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat	October to December	Round 3 8 th November, 2023	No suitable habitat	Species not detected; No further assessment required	
<i>Callistemon linearifolius</i> Netted Bottle Brush	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	October to January	Round 3 8 th of November 2023 and 2 nd Sept, 2024	Round 3 3 rd December 2021	Species not detected; No further assessment required	
<i>Rhodomyrtus psidioides</i> Native Guava	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	All year	Round 3 8 th of November 2023 and 13 th May 2024	No suitable habitat	Species not detected; No further assessment required	
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	No (Surveyed)	Parallel traverses at 10 m intervals across all areas of habitat.	May - July	Round 3 8 th November 2023 and 13 th May 2024	No suitable habitat	Samples collected from one <i>Syzygium</i> sp. in May 2024. Sample was identified as <i>S. oleosum</i> due to numerous large oil glands present in the leaves. Species not detected; No further assessment required.	
<i>Angophora inopina</i> Charmhaven Apple	No (Surveyed)	Parallel traverses at 10-20 m intervals across all areas of habitat.	All year	Round 4 9 th May 2024	Round 4 10 th December 2021	Species not detected; No further assessment required	Round 4
<i>Eucalyptus camfieldii</i> Camfield's Stringybark	No (Surveyed)	Parallel traverses at 20 m intervals across all areas of habitat.	All year	Round 4 9 th of May 2024	Round 4 10 December 2021	Species not detected; No further assessment required	

Scientific Name Common Name	Species Presence	Survey Method	Survey Timing			Conclusion	
			TBDC	Western Ext.	Op. Impacts Area		
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	Yes (Surveyed)	Parallel traverses at 20 m intervals across all areas of habitat.	All year	Round 4 9 th of May 2024	Round 4 10 December 2021	Species detected; further assessment required.	
<i>Corybas dowlingii</i> Red Helmet Orchid	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	June – July	Round 5 21 st June 2024	Round 5 1 July 2024	Species not detected; No further assessment required	Round 5
<i>Diuris praecox</i> Rough Doubletail	No (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	August	Round 6 27 th August, 2024 & 2nd September, 2024	Round 6 1 st August, 2022	Species not detected; No further assessment required	Round 6
<i>Diuris arenaria</i> Sand Doubletail	Yes (Surveyed)	Parallel traverses at 5 m intervals across all areas of habitat.	September	Round 7 9 th September, 2024	Round 7 7 September 2022 & 15 September 2022 (2 rounds)	Species detected; further assessment required.	Round 7



4.2.2 Candidate Threatened Fauna

The following candidate threatened fauna species were surveyed in the appropriate season as per the BAM (**Table 9**). Surveys were undertaken across the Study Area by suitably qualified ecologists. Detailed survey methodologies are provided in the following subsections and in **Appendix 7**. Survey effort for each round of targeted surveys is shown on **Figure 15** and **Figure 16**.

Table 9: Survey of requirements and timing conducted for candidate fauna species

Scientific name	Common name	Survey Requirements	Survey Timing
Mammals			
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	December to March	Remote Cameras 05/01/2024 to 01/02/2024 Spotlighting 8 and 09/05/2024
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	November to January	Anabats (x4) 16/02/2026 to 20/02/2026 Harp Traps (x4) 16/02/2026 to 20/02/2026
<i>Miniopterus australis</i>	Little Bent-winged Bat	December to February	Anabats (x4) 16/02/2026 to 20/02/2026 Harp Traps (x4) 16/02/2026 to 20/02/2026
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat	December to February	Anabats (x4) 16/02/2026 to 20/02/2026 Harp Traps (x4) 16/02/2026 to 20/02/2026
<i>Myotis macropus</i>	Southern Myotis	October to March	Anabats (x4) 16/02/2026 to 20/02/2026 Harp Traps (x4) 16/02/2026 to 20/02/2026
<i>Petauroides volans</i>	Southern Greater Glider	All Year	Remote Cameras 05/01/2024 to 01/02/2024 Spotlighting 8 and 09/05/2024
<i>Petaurus norfolcensis</i>	Squirrel Glider	All Year	Remote Cameras 05/01/2024 to 01/02/2024 Spotlighting 8 and 09/05/2024
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	December to June	Remote Cameras 05/01/2024 to 01/02/2024 Spotlighting 8 and 09/05/2024
<i>Phascolarctos cinereus</i>	Koala	All Year	Assumed Present
<i>Planigale maculata</i>	Common Planigale	All Year	Pitfall traps 29/01/2024 to 03/02/2026

Scientific name	Common name	Survey Requirements	Survey Timing
<i>Potorous tridactylus</i>	Long-nosed Potoroo	All Year	Remote Cameras 05/01/2024 to 01/02/2024 Spotlighting 8 and 09/05/2024
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	October to December	Habitat Assessment 13/05/2024 and 30/10/2024 Spotlighting 8 and 09/05/2024
Birds			
<i>Burhinus grallarius</i>	Bush Stone-curlew	All year	Spotlighting and Call Playback 8 and 09/05/2024
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo	October – January	Habitat Assessment 13/05/2024 and 30/10/2024
<i>Calyptorhynchus lathami lathami</i>	South-eastern Glossy Black-Cockatoo	January - September	Habitat Assessment 13/05/2024 and 30/10/2024
<i>Dromaius novaehollandiae</i>	Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	All year	Habitat Assessment and Opportunistic Surveys 13/05/2024 and 30/10/2024
<i>Esacus magnirostris</i>	Beach Stone-curlew	All year	Spotlighting and Call Playback 8 and 09/05/2024
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	July to September	Habitat Assessment 13/05/2024 and 30/10/2024
<i>Hieraaetus morphnoides</i>	Little Eagle	August to October	Habitat Assessment 13/05/2024 and 30/10/2024
<i>Lophoictinia isura</i>	Square-tailed Kite	September to January	Habitat Assessment 13/05/2024 and 30/10/2024
<i>Pandion cristatus</i>	Eastern Osprey	April-- November	Habitat Assessment 13/05/2024 and 30/10/2024
Amphibians			
<i>Crinia tinnula</i>	Wallum Froglet	All year	Spotlighting 8 and 09/05/2024 Targeted Frog and Reptile Surveys 16/02/2026, 18/02/2026 Annual Monitoring at Newcastle Sands Quarry 26/03/2020, 11/11/2020, 08/11/2021, 2/02/2022, 31/01/2023, 20/02/2024, 9/01/2025, 19/01/2026 and 16/01/2026

Scientific name	Common name	Survey Requirements	Survey Timing
<i>Litoria aurea</i>	Green and Golden Bell Frog	November to March	Spotlighting 8 and 09/05/2024 Targeted Frog and Reptile Surveys 16/02/2026, 18/02/2026 Annual Monitoring at Newcastle Sands Quarry 26/03/2020, 11/11/2020, 08/11/2021, 2/02/2022, 31/01/2023, 20/02/2024, 9/01/2025, 19/01/2026 and 16/01/2026
<i>Uperoleia mahonyi</i>	Mahony's Toadlet	October to March	Spotlighting 8 and 09/05/2024 Targeted Frog and Reptile Surveys 16/02/2026, 18/02/2026 Annual Monitoring at Newcastle Sands Quarry 26/03/2020, 11/11/2020, 08/11/2021, 2/02/2022, 31/01/2023, 20/02/2024, 9/01/2025, 19/01/2026 and 16/01/2026
Reptiles			
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	October to March	Spotlighting 8 and 09/05/2024 Targeted Frog and Reptile Surveys 16/02/2026, 18/02/2026 Annual Monitoring at Newcastle Sands Quarry 26/03/2020, 11/11/2020, 08/11/2021, 2/02/2022, 31/01/2023, 20/02/2024, 9/01/2025, 19/01/2026 and 16/01/2026

4.2.2.1 Survey Methodology

The following sub-sections outline the methods for all fauna surveys conducted across the Study Area. Surveys were completed as per *Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft)* (Department of Environment and Conservation [DEC], 2004) and relevant BAM survey guidelines. Fauna Survey Effort is summarised in following sections and within **Table 9**.

Arboreal Mammals

A total of 30 remote trigger cameras were installed consisting of 16 Arboreal cameras at heights of approximately 3m, 6 Arboreal Pygmy Cameras at heights of approximately 1.5-2m and 8 Terrestrial cameras at heights of approximately 0-1m (**Figure 16**). Cameras were active onsite for 32 consecutive nights from 05 January 2024 to 02 February 2024 (4 weeks). Cameras were baited with an oats, peanut butter, treacle, vanilla essence and truffle oil mixture in a mesh canister, and the surrounding area (including the tree trunk) was sprayed with honey water. Cameras were re-baited once during the survey period, after two weeks. Images were analysed to identify species captured on camera.

Spotlighting surveys were conducted on 8 & 9 May 2024 using high-powered headtorches to search for all types of nocturnal fauna. Spotlighting was undertaken via random meanders for one-person hour traversing the Study Area. Surveys were focussed within areas of the most suitable habitat.

Terrestrial Mammals

Nine pit-fall trap arrays, each comprising 10 m of drift-fence with two black 20 L buckets with lids (**Figure 17**). Buckets were dug into the ground at the end of the drift-fence and the lid was be elevated 2 to 3 cm above the lip of the bucket. Leaf litter and small twigs was placed in the bottom of each bucket to provide shelter for trapped animals. The survey effort was designed in consideration of the requirements under the TBDC.

Two trapping lines of 25 Elliott A's were deployed within the Development area, each running adjacent to the Eastern and Western boundaries. Elliot A's were baited with an oats, peanut butter, treacle, vanilla essence and truffle oil mixture, and trapping was conducted for a period of four consecutive nights; from 29 January 2024 – 02 February 2024.

Koala

The extent and quality of Koala habitat within the On-site Offset Area was determined using the methodology described in *Appendix 6 - Guidelines for Koala Habitat Assessments* of the *Port Stephens Council Comprehensive Koala Plan of Management* (CKPoM) (PSC 2002). The Koala Habitat Assessment is undertaken in four major parts:

- **Preliminary Assessment:** examination of the Koala Habitat Planning Map of the Port Stephens LGA (see **Figure 27**) to determine mapped Koala Habitat and undertake an inspection of the site to determine whether it contains individuals of preferred Koala feed trees (**Table 10**) outside areas mapped as Preferred Koala Habitat.
- **Vegetation Mapping:** mapping vegetation types across the Development Site using aerial photography and detailed ground-truthing. Floristic and structural characteristics of each vegetation community was determined using plot-based survey methods.
- **Koala Habitat Identification:** If the LGA-wide Koala habitat map produced by PSC is inaccurate for the site, a revised map must be developed in accordance with the Koala habitat categories defined in the CKPoM. If it is identified that the site contains either preferred or supplementary Koala habitat, habitat buffers or Habitat linking areas then proceed to Step 4.
- **Assessment of Proposal:** At this point, a map needs to be produced showing information gathered in Steps 1, 2 and 3. The appropriateness of the proposal is assessed using performance criteria from Appendix 4 of the CKPoM. This has been conducted as part of the Ecological Impact Assessment and is detailed in the Environmental Impact Assessment: Proposed Sand Quarry, Cabbage Tree Road Summary Report (Kleinfelder 2016).

Table 10: Preferred Koala feed trees in the Port Stephens LGA recorded within the Impact Area.

Scientific Name	Common Name
<i>Eucalyptus robusta</i>	Swamp Mahogany
<i>Eucalyptus tereticornis</i>	Forest Red Gum
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	Earp's Gum

The vegetation within the Study Area is considered habitat for the species, as such no targeted surveys were completed for the species – the Koala is assumed present within the Impact Area within vegetation zones with Preferred Koala feed trees under the Port Stephens CKPoM.

Microchiropteran Bats

Microbats surveys were completed in accordance with 'Species credit' threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method (OEH 2018). A total of four (4) Anabat™ bat-call detectors were set up within suitable microchiropteran bat habitat and along potential flyways and left to record for four (4) consecutive nights between 16/02/2026 and 20/02/2026 (**Figure 16**). Anabat data was analysed in house by an experienced fauna ecologist. A total of four (4) Harp traps were installed across the Study Area targeting the flyways of microchiropteran bats and in proximity to water bodies (**Figure 16**). Harp traps were left for four consecutive nights between 16/02/2026 and 20/02/2026 and checked each morning at sunrise (16 trap nights).

Birds

Surveys for potential breeding habitat for Gang-gang Cockatoo and Glossy Black-Cockatoo were undertaken during the hollow-bearing tree survey on 31 October 2022, 30 October 2023 and 13 May 2024 (**Figure 15**). One tree with a large hollow in the base and one tree with a small hollow <8cm are present within the Study Area. Therefore, no suitable hollows were present within the site for large forest owls and large parrot species. No suitable nest trees were detected during these surveys for any raptor species (**Figure 8**).

Bush Stone-Curlew and Beach Stone-Curlew were both surveyed over two (2) nights; 8 and 9 May 2024. Surveys were completed by two (2) ecologists undertaking spotlighting transects and call playback through suitable habitat within the Study Area (**Figure 16**).

Reptiles

Targeted surveys were completed for one (1) candidate reptile species; Stephens' Banded Snake (*Hoplocephalus stephensii*).

Surveys were completed in accordance with the Threatened Reptile BAM Survey Guidelines including spotlighting surveys on 16/02/2026 and 18/02/2026, with additional surveys being completed as part of the Newcastle Sands Quarry annual monitoring on 26/03/2020, 11/11/2020, 08/11/2021, 2/02/2022, 31/01/2023, 20/02/2024, 9/01/2025, 19/01/2026 and 16/01/2026. Surveys were completed via random meanders across the Study Area within suitable habitat using high-powered headtorches to search for all types of nocturnal fauna (**Figure 16**).

Amphibians

Surveys were completed in accordance with the NSW Survey Guide for Threatened Frogs including spotlighting surveys on 08/05/2024, 09/05/2024, 16/02/2026 and 18/02/2026, with additional surveys being completed as part of the Newcastle Sands Quarry annual monitoring on 26/03/2020, 11/11/2020, 08/11/2021, 2/02/2022, 31/01/2023, 20/02/2024, 9/01/2025, 19/01/2026 and 16/01/2026. Surveys were completed via random meanders across the Study Area within suitable habitat using high-powered headtorches to search for all types of nocturnal fauna (**Figure 16**).

Weather Data

Rainfall and temperate data for the survey period is provided in **Appendix 7**.



- Vegetation Zone and Plant Community Type**
- VZ1- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Moderate)
 - VZ2- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Shrubby Regrowth)
 - VZ3- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Managed)
 - PCT 3996: Coastal Sand Swamp Mahogany Dry Forest (Moderate)
 - Exotic Grassland
 - Infrastructure, Tracks and Monitoring

- | | | | |
|--------------|-----------------------------|------------------------|---------------|
| Subject land | Approved quarry | Call Playback Location | Arterial Road |
| Study area | Spotlighting (8th May 2024) | Camera- Arboreal | Contour (10m) |
| Impact area | Spotlighting (9th May 2024) | Camera- Terrestrial | |

Figure 16: Fauna Surveys – Targeted Surveys

1



Arbus PTY LTD, Mod 4 - Newcastle Sand Cabbage Tree road Williamtown, NSW, 2318



Date: 17/03/2026
By: Natalia Laws
GDA94 / MGA zone 56
Source: © Aerometrex

WedgeTail Project Consulting Pty Ltd - Documents\Newcastle Sand\2024\03\2026\PROJECT_BOOK_Figures_202310\24-03-26_Newcastle_Sand_PCT_3_Book\2026\16_Fauna-Survey_Targeted-Survey1



- Vegetation Zone and Plant Community Type**
- VZ1- PCT 3544: Coastal Sands
Apple-Blackbutt Forest (Moderate)
 - VZ2- PCT 3544: Coastal Sands
Apple-Blackbutt Forest (Shrubby Regrowth)
 - VZ3- PCT 3544: Coastal Sands
Apple-Blackbutt Forest (Managed)
 - PCT 3996: Coastal Sand Swamp
Mahogany Dry Forest (Moderate)
 - Exotic Grassland
 - Infrastructure, Tracks and Monitoring

- Subject land
- Study area
- Impact area
- Approved quarry
- Survey track: Frog (16th Feb 2026)
- Survey track: Frog (4th Mar 2026)
- Elliot trap array
- Elliot A- terrestrial
- Pitfall trap Line
- Anabat
- Harp trap
- Arterial Road
- Contour (10m)

Figure 17: Fauna Surveys - Targeted Surveys
2



Date: 17/03/2026
By: Natalia Laws
GDA94 / MGA zone 56
Source: © Aerometrex

4.2.2.2 Fauna Survey Results

A total of 30 species of fauna were detected within the Study Area during field surveys (**Appendix 3**). This includes four (4) bird, 30 mammal, three (3) reptile, and nine (9) amphibian species. A total of four (4) threatened fauna species were detected within the Study Area, and one (1) species was assumed present based on the presence of suitable habitat. Threatened species recorded within the Study Area are shown in **Figure 18** and include the following:

- **Wallum Froglet (*Crinia tinnula*)** - was heard on one (1) occasion during targeted surveys within the Study Area.
- **Mahony's Toadlet (*Uperoleia mahonyi*)** – was recorded at six separate locations within the Study Area including in pitfall traps.
- **Squirrel Glider (*Petaurus norfolcensis*)** – Glider species (*Petaurus sp.*) were identified on site via remote camera trapping at eight locations (Cameras 35, 36, 39, 40, 43, 52, 54 and 56). At these eight locations, a total of fifteen detections were made, with four (4) individuals identified as the Squirrel Glider (*Petaurus norfolcensis*) (one sighting only identified a 'possible' detection) (RC 36, RC 39, RC 39, and RC 43), other glider detections were identified as common Sugar Glider (*Petaurus breviceps*) and Feathertail Glider (*Acrobates pygmaeus*).
- **Grey-headed Flying-fox (*Pteropus poliocephalus*)** – was recorded during spotlighting surveys flying over the Study Area. No breeding camps were found to occur within the Study Area or Impact Area, so no species polygons were created.
- **Koala (*Phascolarctos cinereus*)** – due to the high number of records of the species within the locality and the presence of preferred feed tree species, Koala was assumed present.
- **Southern Myotis (*Myotis macropus*)** – Species Credit Species recorded at one (1) Anabat location within the Study Area. No suitable foraging habitat occurs within 200m of the Impact Area
- **Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)** – Ecosystem Credit Species recorded at one (1) Anabat location within the Study Area during targeted surveys
- **Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)** – Ecosystem Credit Species recorded at one (1) Anabat location within the Study Area during targeted surveys
- **Little Bent-winged Bat (*Miniopterus australis*)** – Dual Credit Species (Species/Ecosystem) recorded at four (4) Anabat locations within the Study Area during targeted surveys. No suitable roosting habitat occurs within the locality so the species is considered an Ecosystem Credit Species for this assessment
- **Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)** – Dual Credit Species (Species/Ecosystem) recorded at three (3) Anabat locations within the Study Area during targeted surveys. No suitable roosting habitat occurs within the locality so the species is considered an Ecosystem Credit Species for this assessment

4.3 IDENTIFIED THREATENED SPECIES

Step 5: Determine the area or count, and location of suitable habitat for species credit species and
Step 6: Determine the habitat condition within the species polygon for species assessed by area.

The following species credit species were identified within the Impact Area:

***Diuris arenaria* (Sand Doubletail)**

One (1) individual was recorded within the Study Area. Following amendments to the proposed Impact Area no individuals occur within the Impact Area. A species polygon has been mapped within the Impact Area representing suitable habitat for the species, this includes areas of PCT 3544 with an intact native ground layer (Vegetation Zone 1, 2, and 3) (see **Figure 19**).

Total area of species polygon: **2.88 ha**

***Eucalyptus parramattensis* subsp. *parramattensis* (Earp's Gum)**

A total of 32 individuals were recorded within the Study Area, of these eight (8) individuals of this species occur within the proposed Impact Area, and three (3) individuals occur within 5 m of the Impact Area. For the purpose of this assessment a total of eleven (11) plants are assumed to be impacted under the proposed development. The location of impacted and retained individuals of this species are shown in **Figure 20**, as a count based species the credit obligation is based on the number of individuals impacted, not the area of suitable habitat.

Total impacted for the species is: eleven (11) individuals (count based).

***Wallum Froglet* (*Crinia tinnula*)**

The species was heard on one (1) occasion during targeted surveys within the Study Area. In accordance with the NSW Survey Guide for Threatened Frogs "*the species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 50 metres radius from the top of bank*". As such all suitable areas of aquatic habitat within the Subject Land were mapped and a 50 buffer was established from the top of bank. As PCT 3544 is associated with the species areas of this PCT within the 50 m buffer were incorporated into a species polygon for the species (**Figure 21**).

Total area of species polygon: **0.32 ha**

***Mahony's Toadlet* (*Uperoleia mahonyi*)**

The species was recorded at six (6) separate locations within the Study Area including in pitfall traps. In accordance with the NSW Survey Guide for Threatened Frogs "*the species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 400 metres radius from the top of bank of the breeding site*". As such all suitable areas of aquatic habitat within the Subject Land were mapped and a 400 buffer was established from the top of bank. As PCT 3544 is associated with the species areas of this PCT within the 400 m buffer were incorporated into a species polygon for the species (**Figure 22**).

Total area of species polygon: **2.88 ha**.

Squirrel Glider (*Petaurus norfolcensis*)

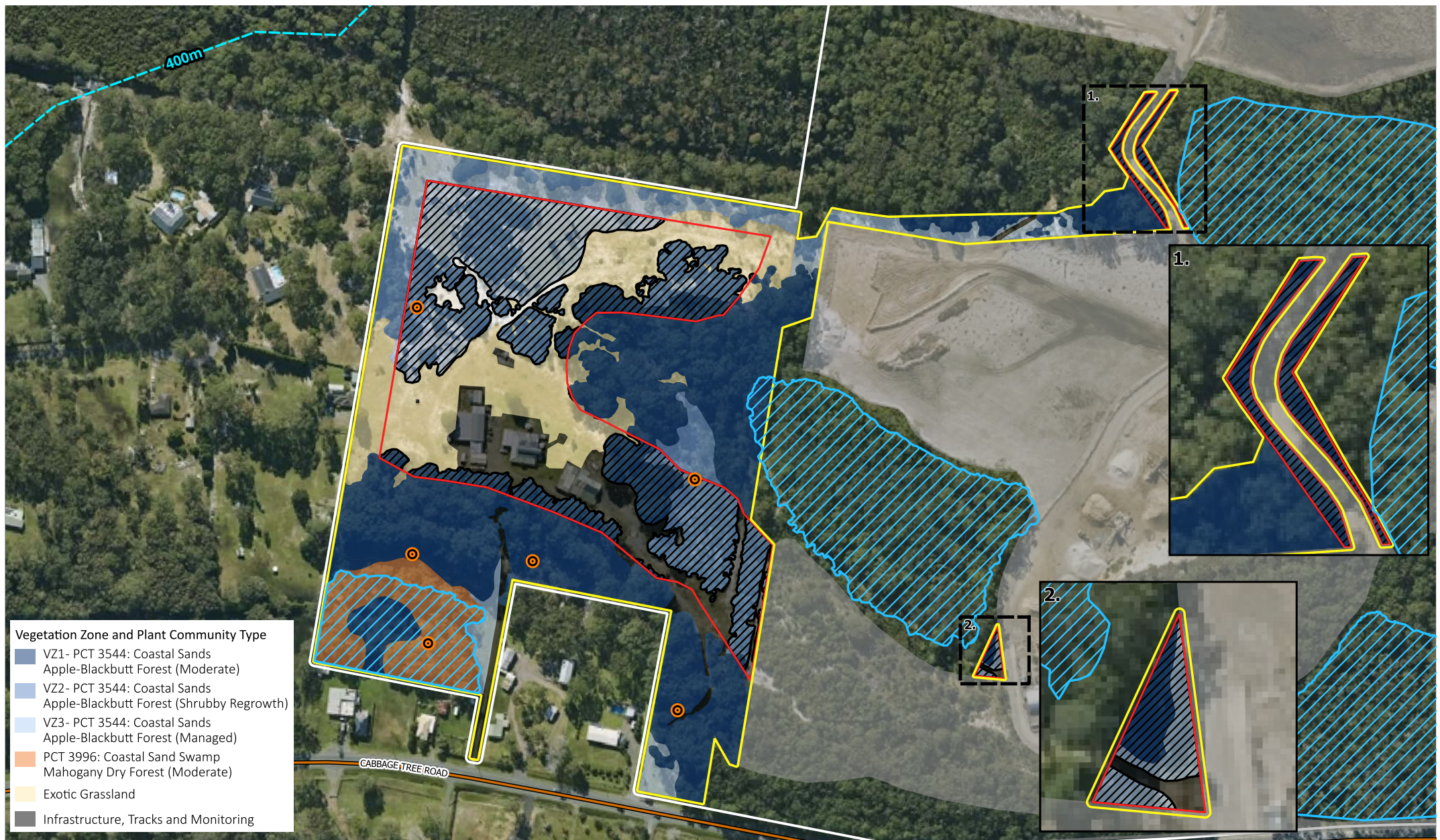
A total four (4) individuals identified as the Squirrel Glider (*Petaurus norfolcensis*) were recorded within the Study Area. Areas of PCT 3544 representing suitable habitat for the species (suitable foraging habitat) include Vegetation Zone 1 and 2. The species polygon is shown in **Figure 23**.

Total area of species polygon: **2.20 ha**.

Koala (*Phascolarctos cinereus*)

Due to the high number of records of the species within the locality and the presence of preferred feed tree species, Koala was assumed present. Areas of PCT 3544 representing suitable foraging habitat for the species (with known koala feed trees) include Vegetation Zone 1. The species polygon is shown in **Figure 24**.

Total area of species polygon: **0.74 ha**.



Vegetation Zone and Plant Community Type

- VZ1- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Moderate)
- VZ2- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Shrubby Regrowth)
- VZ3- PCT 3544: Coastal Sands Apple-Blackbutt Forest (Managed)
- PCT 3996: Coastal Sand Swamp Mahogany Dry Forest (Moderate)
- Exotic Grassland
- Infrastructure, Tracks and Monitoring

Subject land Approved quarry Mahony Toadlet (*Uperoleia mahonyi*) Contour (5m)
 Study area Core habitat (top of bank) Arterial Road
 Impact area Mahony Toadlet (*Uperoleia mahonyi*) Species Polygon

Figure 22: Mahony's Toadlet (*Uperoleia mahonyi*) Species Polygon




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Date: 17/03/2026
 By: Natalia Laws
 GDA94 / MGA zone 56
 Source: © Aerometrex

Arbus PTY LTD, Mod 4 - Newcastle Sand Cabbage Tree road Williamtown, NSW, 2318

Wedgetail Project Consulting/Arbus - Documents/Newcastle Sand/2024/03/17/03/2026/PROJECT_BOOK_Figures/2023/03/24/GD02_Newcastle_sand/NATL_56GDA94/022/Mahonyi_toadlet

5. IMPACT ASSESSMENT

5.1 AVOIDING AND MINIMISING IMPACTS

Application of the Mitigation Hierarchy seeks to firstly avoid impacts, and then if required, minimize (mitigate) impacts. The residual impacts (i.e., being those not avoided or minimized) are then offset pursuant to section 6.4(1) of the *Biodiversity Conservation Act 2016* (Preston CJ in *Denoci Pty Ltd v Liverpool City Council* [2020] NSWLEC 102 (Denoci judgement) at [27], and *IRM Property Group (No. 2) Pty Ltd v Blacktown City Council* [2021] NSWLEC 1306 (IRM)).

5.1.1 Avoid and Minimise Approach

The key avoidance and minimisation measures for the proposal are outlined in **Table 11** below.

Table 11: Avoidance and minimisation measures

Biodiversity Value	Detail	Avoidance Approach	Residual Impact
Threatened Flora	<i>Diuris arenaria</i> (Sand Doubletail)	The proposed Impact Area has been amended following the identification of <i>Diuris arenaria</i> . The amended Impact Area results in no direct impacts to the species and reduces impacts to suitable habitat for the species within the Study Area.	No direct impacts to the species. Impacts to 2.88 ha of suitable habitat for the species which is 36% of suitable habitat within the Study Area.
	<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> (Earp's Gum)	The proposed Impact Area has been amended to minimise impacts to the species. A total of eleven (11) individuals will be impacted by the proposed development, a reduction from the original design which impacted 29 plants.	A total of eleven (11) plants will be impacted representing 33% of plants identified within the Study Area.
Threatened Fauna Habitat	Wallum Froglet (<i>Crinia tinnula</i>)	The proposed Impact Area avoids direct impacts to suitable aquatic habitat for the species. The proposed Impact Area has been further reduced to avoid the 50 m suitable habitat buffer for the species. However, we have expanded the mapping of core habitat for the species to the maximum potential extent of core habitat (based on DEM contours). As such, the current proposal will impact a total of 0.32 ha of suitable habitat, an increase in the original proposed impacts of 0.13 ha. The proposal is not expected to result in impacts to water quality, waterbodies, or hydrological processes that would adversely affect the aquatic habitat of the species.	The proposal will impact a total of 0.32 ha of suitable habitat for the species (within 50 m of aquatic habitat). This represents 11 % of suitable habitat within the Study Area.
	Mahony's Toadlet (<i>Uperoleia mahonyi</i>)	The proposed Impact Area avoids direct impacts to suitable aquatic habitat for the species. The proposed Impact Area has been further reduced to avoid areas within the 400 m suitable habitat buffer for the species. The current proposal will impact a total of 2.88 ha	The proposal will impact a total of 2.88 ha of suitable habitat for the species (within 400 m of aquatic habitat). This represents 36 % of

Biodiversity Value	Detail	Avoidance Approach	Residual Impact
		of suitable habitat, a reduction from the original proposed impacts of 4.67 ha. The proposal is not expected to result in impacts to water quality, waterbodies, or hydrological processes that would adversely affect the aquatic habitat of the species.	suitable habitat within the Study Area.
	Squirrel Glider (<i>Petaurus norfolcensis</i>)	The proposal is located within vegetated areas previously cleared and dredged by RZM for mineral sands. The proposal avoids impacts to more mature regeneration areas within the Study Area (Vegetation Zone 1). These areas represent the highest quality foraging habitat for the species within the Study Area. Impacts to suitable habitat for the species (Vegetation Zone 1 and 2) were further reduced following amendments to the proposed Impact Area. A total of 2.20 ha of suitable habitat is proposed to be impacted, a reduction from the original impact of 4 ha of suitable habitat. No hollows suitable for the species will be impacted by the proposal. A reduction from the earlier Impact Area where a total of two (2) hollows were being impacted. Impacts to habitat connectivity for the species have been further reduced through the removal of the northern access route between the existing sand mine and the Western Extension. Impacts to connectivity to the south have been minimised by staging impacts and rehabilitation along this corridor.	The proposal will impact a total of 2.20 ha of suitable habitat for the species, representing 33% of suitable habitat for the species within the Study Area. The proposal will impact a total of 0.74 ha of Vegetation Zone 1 (higher quality habitat), representing 16 % of Vegetation Zone 1 within the Study Area.
	Koala (<i>Phascolarctos cinereus</i>)	The proposal is located within vegetated areas previously cleared and dredged by RZM for mineral sands. The proposal avoids impacts to more mature regeneration areas within the Study Area (Vegetation Zone 1). These areas contain preferred koala feed tree species and therefore represent the highest quality foraging habitat for the species within the Study Area. Impacts to Vegetation Zone 1 were further reduced following amendments to the proposed Impact Area. A total of 0.74 ha of Vegetation Zone 1 is proposed to be impacted, a reduction from the original impact of 2.4ha of Vegetation Zone 1. Impacts to habitat connectivity for the species have been further reduced through the removal of the northern access route	The proposal will impact a total of 0.74 ha of suitable habitat for the species, representing 16% of suitable habitat for the species within the Study Area.

Biodiversity Value	Detail	Avoidance Approach	Residual Impact
		between the existing sand mine and the Western Extension. Impacts to connectivity to the south have been minimised by staging impacts and rehabilitation along this corridor.	
	Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>)	The vegetation within the Study Area represents broadly suitable foraging habitat for the species. The proposal prioritises the retention of the highest condition foraging habitat (i.e. with winter flowering feed species) in Vegetation Zone 1. No camps were recorded within the Subject Land	The proposal will impact a total of 0.74 ha of broadly suitable foraging habitat for the species (Vegetation Zone 1).
Biodiversity Values Mapping	Core Habitat within an approved Koala Plan of Management (Koala SEPP)	Areas within the Subject Land are mapped on the Biodiversity Values mapping, associated with Core Habitat as mapped under the Port Stephens CKPoM. These areas are avoided by the proposal.	None
Fauna Habitat Features	A total of eight (8) hollow bearing trees were identified within the Study Area	The amended Impact Area reduced impacts to hollow-bearing trees from two (2) to none.	None
Mapped Water Courses	No Mapped Watercourses occur within the Study Area	N/A	None
Wetlands	Mapped Wetlands	Wetland mapping sourced from the Port Stephens LEP was reviewed in conjunction with ground truthing to inform quarry design minimising impacts to local wetlands, as such avoiding impacts on Swamp vegetation types (TECs) within the Study Area.	None
Groundwater Dependent Ecosystems (GDE)	GDE Atlas mapping identifies Moderate and High Potential GDEs within the Study Area. Direct impacts are limited, while indirect impacts are avoided.	Impacts to Groundwater Dependent Ecosystems (GDEs) within the Study Area are avoided through the location of the proposed extraction and limitations on the depth of extraction. See GES 2026 for updated Groundwater Assessment. The depth of the proposed extraction is to 0.7 m above the maximum predicted groundwater, with the rehabilitated final landform to be 1 m. At this depth the modification will not impact groundwater aquifer, therefore there will not be a drawdown effect on the aquifer which sustains obligate Groundwater Dependent Ecosystems (GDEs) identified within the Study Area including areas of Swamp Sclerophyll Forest TEC. Considering the depth of the watertable within the Impact Area, the vegetation directly impacted by the proposal is considered to be either facultative or non-GDE communities.	No impacts

Biodiversity Value	Detail	Avoidance Approach	Residual Impact
		Ongoing monitoring of groundwater will occur throughout operation in accordance with the Maximum Excavation Level (MEL) Management Plan.	
Habitat Connectivity	Likely movement corridors include: An east-west corridor parallel to Cabbage Tree Road. A partial north-south corridor along the western boundary of Lot 100/DP 1263921.	Impacts to habitat connectivity for locally occurring species have been reduced through the removal of the previously proposed northern access route between the existing sand mine and the Western Extension. Impacts to connectivity to the south have been minimised by staging impacts and rehabilitation along this corridor.	Staged impacts to part of the north-south corridor minimised through staging and rehabilitation.
High Condition Vegetation Zones	Vegetation Zone 1 represents the highest condition vegetation and habitat within the Study Area.	Impacts to the highest condition vegetation within the Study Area will be largely avoided. All vegetation within the Impact Area was previously cleared and dredged by RZM for mineral sands. The proposal avoids impacts to more mature regeneration areas within the Study Area (Vegetation Zone 1). Operational Impacts have been located within degraded areas of vegetation on the edge of the existing quarry.	Impacts to the highest condition vegetation within the Subject Site will be avoided
Threatened Ecological Communities	No Threatened Ecological Communities (TEC) occur within the Study Area.	N/A	N/A
Core Koala Habitat	Vegetation Zone 1 and PCT 3996 is considered 'Preferred Koala Habitat' in accordance with the Port Stephens CKPoM. Vegetation Zones 2 and 3 are considered 'Marginal' or 'Mainly Cleared' koala habitat and represent a 'Preferred Koala Habitat Link'	Impacts to Koala Habitat have been reduced following amendment of the proposed footprint: Preferred Koala Habitat Impacts reduced from 2.4 ha to 0.74 ha Preferred Koala Habitat Link over Marginal/Cleared Land Impacts reduced from 4 ha to 5.02 ha	A total of 0.74 ha of foraging habitat for the Koala will be impacted by the proposal

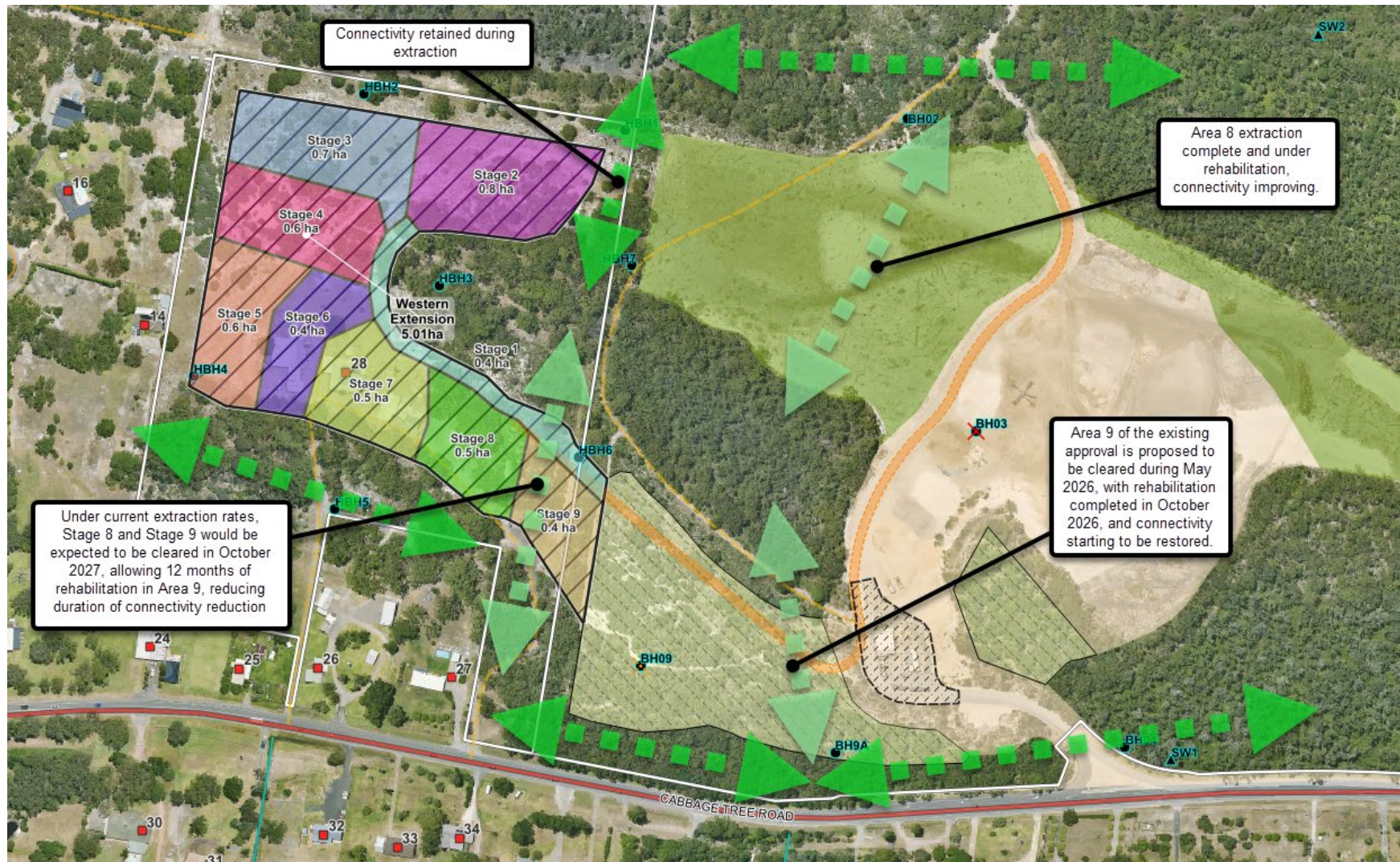


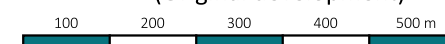
Plate 5: Proposed Staging Plan – MOD 4



- | | | | |
|--------------------------|----------------------------|---|------------------------------------|
| Subject land | Avoided impact | <i>Diuris arenaria</i>
(Double Sandtail) | Hollow-bearing tree |
| Previous extraction area | Excluded area | <i>Eucalyptus camfieldii</i>
(Camfield's Stringybark) | Indicative fauna movement corridor |
| Impact area | Core habitat (top of bank) | <i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>
(Earp's Gum) | Arterial Road |

Contour (10m)

Figure 25: Avoidance and Minimisation
(Original development)

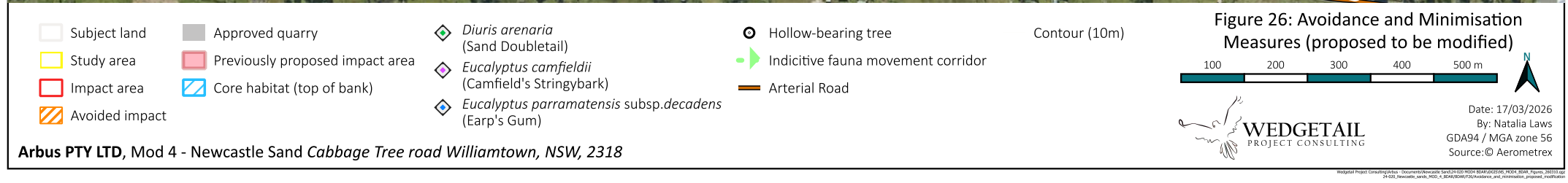


Arbus PTY LTD, Mod 4 - Newcastle Sand Cabbage Tree road Williamtown, NSW, 2318



Date: 17/03/2026
By: Natalia Laws
GDA94 / MGA zone 56
Source: © Aerometrex

WedgeTail Project Consulting\Arbus - Documents\Newcastle Sand\Mod 4\BOM\BOM\20250317\Figures\Fig25\Fig25_01_Northern_Sandtail_Avoidance_Minimisation_Original.dwg



100 200 300 400 500 m

By: Natalia Lav
GDA94 / MGA zone 1
Source: © Aeromet

WEDGETAIL
PROJECT CONSULTING

Insulated Project Consulting Ltd., documents generated by PROJECT TOWER ENGINEERING PCLD using
PCLD, Insulation, area, MGA, & ROADWORK/CONCRETE and information provided

5.1.2 Prescribed Biodiversity Impacts

The following are prescribed impacts which need to be considered as per section 8.3 of the BAM (DPIE 2020a).

Impacts of the proposal on threatened entities associated with karst, caves, crevices, cliffs, rocks and other geological features of significance

The proposal will not result in impacts to karst, caves, crevices, cliffs, rocks and other geological features of significance.

Impacts of the proposal on the habitat of threatened entities associated with human-made structures or non-native vegetation

As abandoned buildings can represent potential roosting habitat for some locally occurring microbats, old sheds present within the Study Area were all inspected by an experienced fauna ecologist. These buildings were not considered suitable roosting habitat as all cavities were sealed. As such, the proposal will not result in impacts to habitat of threatened species associated with human-made structures or non-native vegetation.

Impacts of the proposal on connectivity of habitat of threatened entities

Likely movement corridors include an east-west corridor parallel to Cabbage Tree Road, and a partial north-south corridor along the western boundary of Lot 100/DP 1263921. Impacts to habitat connectivity for locally occurring species have been reduced through the removal of the previously proposed northern access route between the existing sand mine and the Western Extension. Impacts to connectivity to the south have been minimised by staging impacts and rehabilitation along this corridor, while rehabilitation within the current sand quarry will continue to enhance connectivity (see **Plate 6**).

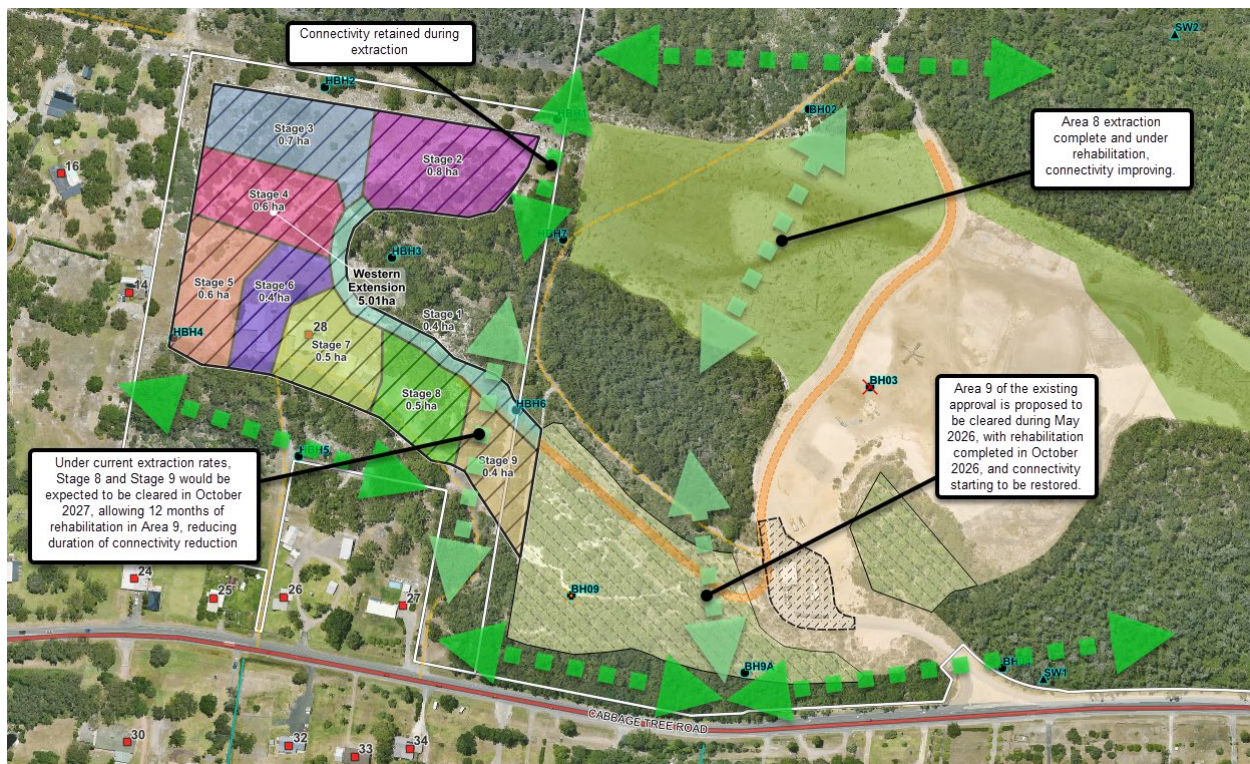


Plate 6: MOD 4 Staging Plan

Impacts of the development on water quality, bodies and hydrological processes that sustain threatened species or ecological communities

Impacts to Groundwater Dependent Ecosystems (GDEs) within the Study Area are avoided through the location of the proposed extraction and limitations on the depth of extraction.

The depth of the proposed extraction is to 0.7 m above the maximum predicted groundwater, with the rehabilitated final landform to be 1 m. At this depth the modification will not impact groundwater aquifer, therefore there will not be a drawdown effect on the aquifer which sustains obligate Groundwater Dependent Ecosystems (GDEs) identified within the Study Area including areas of Swamp Sclerophyll Forest TEC. Considering the depth of the watertable within the Impact Area, the vegetation directly impacted by the proposal is considered to be either facultative or non-GDE communities. See **Newcastle Sand – Maximum Extraction depth Management Plan for MOD 4 Western Extension Area (GES 2026)** for updated Groundwater Assessment.

Ongoing monitoring of groundwater will occur throughout operation in accordance with the Maximum Excavation Level (MEL) Management Plan.

As such, the proposal is not expected to result in impacts to water quality, waterbodies, or hydrological processes that would adversely affect the aquatic habitat of identified threatened species.

Impact of wind turbine strikes on protected animals

Not applicable to the current application.

Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

Given the nature of the proposal, impacts of vehicle strikes on threatened species or animals are unlikely to be exacerbated beyond that already occurring within the Subject Land. To minimise potential impacts from increased movement of vehicles during the construction phase appropriate mitigation measures will be enforced, as outlined in **Section 5.3**.

5.1.3 Approved avoidance and minimisation measures

A summary of previously approved avoidance and minimisation measures implemented under the original development (SSD-6125) following consultation with the determining authority, are outlined below and illustrated in **Figure 25**.

Impact Avoidance

- Redesign resulted in a reduction of resource footprint from 53.9 ha to 42.25 ha (22%)
- Redesign resulted in a reduction of impacts to native vegetation by 22.5% including habitat for threatened species being reduced from 48.1 ha to 40.38 ha, a reduction in impacts to hollow-bearing trees, and the number of *Eucalyptus parramattensis subsp. parramattensis* from 284 plants to 230 plants (19% reduction)
- Redesign resulted in a reduction of impacts to koala habitat from initial proposal, with the extraction area being re-designed to ensure that no areas of habitat are isolated and movement corridors through the site are maintained
- Establishment of a 50 m buffer from the Tilligerry State Conservation Area (SCA)

- Follow assessment an extraction and rehabilitation plan was created detailing the sequencing of extraction to limit the area exposed during operations to active quarrying blocks (i.e. Staging). A progressive rehabilitation plan was established with rehabilitation to commence in each extraction block once quarrying is completed in each block.

Impact Minimisation

- Establishment of a biodiversity offset strategy
- Establishment of a Biodiversity Management Plan
- Reduction in noise pollution impacts including a change of the predominant extraction method to portable electric conveyors fed by front end loaders. This will reduce noise sources, dust generation and diesel consumption. Change to electric processing (conveyors, stackers, screens and air separator) that will be predominantly powered by mains power, and the removal of a tub grinder from operations.

5.2 ASSESSMENT OF IMPACTS

5.2.1 Impacts on Native Vegetation and Habitat

5.2.1.1 Direct Impacts

Direct impacts associated with the proposal are detailed below.

Table 12 Change in Vegetation Integrity Scores – Vegetation Zones

Zone	PCT & Class / Species	Area (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Score
1	PCT 3544 (Moderate)	0.74	72.5	0	-72.5
2	PCT 3544 (Shrubby Regen)	1.46	20	0	-20
3	PCT 3544 (Managed)	0.69	17.5	0	-17.5
Subtotal		2.88	-	-	-
Non-native vegetation zones					
	Exotic Grassland	2.88	N/A	N/A	N/A
	Existing Infrastructure and Tracks and cleared land	0.92	N/A	N/A	N/A
Subtotal		2.27	-	-	-
Total		5.15	-	-	-

Table 13 Change in Vegetation Integrity Scores – Species Polygon

Zone	PCT & Class / Species	Area (ha)/Count	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Score
<i>Diuris arenaria</i> (Sand Doubletail)					
1	PCT 3544 (Moderate)	0.74	72.5	0	-72.5
2	PCT 3544 (Shrubby Regen)	1.46	20	0	-20
3	PCT 3544 (Managed)	0.69	17.5	0	-17.5

Zone	PCT & Class / Species	Area (ha)/Count	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Change in Vegetation Integrity Score
Subtotal		2.88	-	-	-
<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> (Earp's Gum)					
1	PCT 3544 (Moderate)	11	0.74	72.5	0
2	PCT 3544 (Shrubby Regen)	0	1.46	20	0
3	PCT 3544 (Managed)	0	0.69	17.5	0
Subtotal		11	-	-	-
Wallum Froglet (<i>Crinia tinnula</i>)					
1	PCT 3544 (Moderate)	0.12	72.5	0	-72.5
2	PCT 3544 (Shrubby Regen)	0.17	20	0	-20
3	PCT 3544 (Managed)	0.02	17.5	0	-17.5
Subtotal		0.32	-	-	-
Mahony's Toadlet (<i>Uperoleia mahonyi</i>)					
1	PCT 3544 (Moderate)	0.74	72.5	0	-72.5
2	PCT 3544 (Shrubby Regen)	1.46	20	0	-20
3	PCT 3544 (Managed)	0.69	17.5	0	-17.5
Subtotal		2.88	-	-	-
Squirrel Glider (<i>Petaurus norfolcensis</i>)					
1	PCT 3544 (Moderate)	0.74	72.5	0	-72.5
2	PCT 3544 (Shrubby Regen)	1.46	20	0	-20
3	PCT 3544 (Managed)	0	17.5	0	-17.5
Subtotal		2.89	-	-	-
Koala (<i>Phascolarctos cinereus</i>)					
1	PCT 3544 (Moderate)	0.74	72.5	0	-72.5
2	PCT 3544 (Shrubby Regen)	0	20	0	-20
3	PCT 3544 (Managed)	0	17.5	0	-17.5
Subtotal		0.74	-	-	-

5.2.1.2 Indirect Impacts

The proposal has the potential for edge effects on the adjoining vegetation. Potential indirect impacts resulting from the proposal and future development application include:

- Increased weed invasion and potential spread/introduction of pathogens to retained vegetation.
- Accidental incursions during clearing.
- Reduced viability of adjoining habitats due to increased noise, dust or light spill.

- Increase in rubbish dumping in adjoining habitats.
- Increase in runoff and sedimentation.

These potential indirect impacts may affect vegetation adjacent to the Study Area. Provided appropriate mitigation measures and management plans are enforced, the proposed development is unlikely to indirectly impact threatened species, ecological communities, and their habitats during construction and operational phases. Appropriate mitigation measures are detailed in **Section 5.3**.

5.2.2 Prescribed Biodiversity Impacts

The proposal has the potential to impact on one prescribed impact, the connectivity of habitat facilitating movement of threatened species. However, site selection, design and layout have all been considered and amendments to the proposal were used to minimise impacts to connectivity between habitats.

5.2.3 Cumulative Impacts of the Development to be modified

The total impacts of the development to be modified are outlined below in **Table 14**.

Table 14: Cumulative Impacts of the Development to be modified

Vegetation Community / Species	SSD-6125 (approved)	SSD-6125-4 (as modified)	Variation in Impacts (ha/count)
Vegetation Communities			
Coastal Sand Apple – Blackbutt Forest (Moderate Condition) VZ 1 PCT 3544 (Moderate)	18.35	17.92 ha (inc. increase from proposed MOD Impact Area [+0.74 ha] and reduction of 1.17 ha from Avoided Impacts Areas)	- 0.43
Coastal Sand Apple – Blackbutt Forest (Regenerating Vegetation) / VZ 2 PCT 3544 (Shrubby)	2.84	4.3 ha	+1.46
Coastal Sand Apple – Blackbutt Forest (Rehabilitation) / VZ 3 PCT 3544 (Managed)	19.01	19.70 ha	+0.69
Coastal Sand Wallum Woodland-Heath	0.04	0.04	+0
Swamp Mahogany – Paperbark Swamp Forest	0.13	0.13	+0
Coastal Wet Sand Cyperoid Heath	-	-	+0
Tomago Sand Swamp Heath	-	-	+0
Tomago Sand Swamp Woodland	-	-	+0
Exotic Vegetation	-	1.35	+1.35
Excluded Land (Cleared Land)	1.88	2.8	+0.92
Total	42.25	47.59	+5.34
Native Vegetation (Subtotal)	40.37	42.09	+1.72
Exotic Vegetation/Cleared (Subtotal)	1.88	5.5	+3.62

Vegetation Community / Species	SSD-6125 (approved)	SSD-6125-4 (as modified)	Variation in Impacts (ha/count)
Threatened Species Habitat			
<i>Diuris arenaria</i> (Sand Doubletail)*	-*	2.88 ha	+ 2.88 ha
<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> (Earp's Gum)	230 Plants	241 Plants	+11 Plants
Wallum Froglet (<i>Crinia tinnula</i>)	0.71 ha	1.41 ha	+ 0.7 ha
Mahony's Toadlet (<i>Uperoleia mahonyi</i>)*	0.13 ha	3.01 ha	+ 2.88 ha
Squirrel Glider (<i>Petaurus norfolcensis</i>)	40.38 ha	41.41 ha (inc. increase from proposed MOD Impact Area [+2.20 ha] and reduction of 1.17 ha from Avoided Impacts Areas)	+ 1.03 ha
Koala (<i>Phascolarctos cinereus</i>)	40.38 ha	39.95 ha (inc. increase from proposed MOD Impact Area [+0.74 ha] and reduction of 1.17 ha from Avoided Impacts Areas)	-0.43 ha
<i>Eucalyptus camfieldii</i> (Camfield's Stringybark)	227 plants	219 plants	- 8 plants

*The species was not recorded during targeted surveys completed for SSD-6125

** impacts to "core habitat" differ from current impact calculation requirements (400m buffer from aquatic habitat)

5.2.4 Existing Offset Obligation and Strategy

The original development consent (SSD 6125) detailed requirements of the Biodiversity Offset Strategy in Clause 32, including the retirement of the following biodiversity credits, i.e. "Table 4: Biodiversity credits to be retired from the 131 ha offset area on the development site":

- HU851 – 311
- HU860 – 273
- HU917 – 80
- HU938 – 388
- HU948 – 115
- HU965 – 22
- Camfield's Stringybark (*Eucalyptus camfieldii*) – 11,651
- Earp's Gum (*Eucalyptus parramattensis* subsp. *decadens*) – 4,501
- Small-flowered Grevillea (*Grevillea parviflora parviflora*) – 724
- Eastern Osprey – 717
- Koala – 744
- Wallum Froglet – 606

The retirement of these credits are pending the establishment of an onsite Biodiversity Stewardship Agreement (BSA). This BSA is underway, with surveys already being completed to validate vegetation mapping and management data.

Biodiversity credits to be retired from an off-site offset area have already been retired and include the following: HU860 (687 credits) and Koala (306 credits).

5.3 MITIGATE AND MANAGE IMPACTS ON BIODIVERSITY VALUES

The measures outlined in **Table 15** are designed to minimise and avoid potential impacts associated with the proposal.

Table 15: Mitigation Measures

Impact	Action and Outcome	Responsibility	Timing
Direct and Prescribed Impacts			
Clearing of Native Vegetation	- Clearly delineate the boundaries of the Development Site to ensure no accidental incursions within retained vegetation - Ensure vehicle and equipment parking areas and stockpile areas are identified and sited to avoid areas containing ecological value wherever practicable - Appropriate signage such as 'No Go Zone' or 'Environmental Protection Area' to be installed - Identify and communicate the location of any 'No Go Zones' in site inductions. - Frog fencing has been installed around the boundary of the existing quarry and will extend around the proposed Impact Area. This fence is similar to sediment fencing however it is installed on an angle that leans back away from the boundary. The backward angle directs frogs that jump onto the fencing back into the area they have come from. - Progressive rehabilitation of the Impact Area in accordance with the exiting site Management Plan.	Construction Site Manager	Prior to, during and post vegetation clearing
Removal of hollow-bearing trees, resulting in fauna injury and mortality	- All potential hollow-bearing trees to be marked prior to clearing. All other vegetation to be cleared, and hollow-bearing trees to be left for two nights to allow fauna to self-relocate - All habitat trees to be soft-felled to reduce potential impacts on inhabiting fauna - A suitably qualified and trained fauna handler is to be present during hollow-bearing tree clearing to rescue and relocate displaced fauna.	Construction site manager	Prior to and during habitat tree removal
Impacts to surface quality and quantity due to sediment run-off and/or	- Source controls such as sediment fences, mulching and jute matting will be utilised where appropriate - Site-based vehicles will carry spill kits.	Construction site manager	During all surface disturbance works when the site is under construction

Impact	Action and Outcome	Responsibility	Timing
contaminant runoff			
Indirect and Prescribed Impacts			
Transfer of weeds and pathogens	- Fungal pathogens, including <i>Phytophthora cinnamomi</i> and Myrtle Rust (<i>Puccinia psidii</i>), can impact on native plant communities and inhabiting fauna if not managed. Vehicles and equipment to be washed down prior to arrival on-site - Ensure soil and seed material is not transferred on machinery through appropriate wash down procedures	Construction site manager	During construction works
Noise, vibration, waste and air pollution impacts to adjacent sensitive habitat areas	- Restriction of public access and associated impacts from domestic pets, waste dumping and damage to adjoining vegetation must be enforced pre, during and post construction - Fence sensitive areas to delineate 'no go' zones - Impacts of noise and light will be limited as night works are not proposed - Dust control measures will include covering loads where required; amending operations under excessive wind conditions including ceasing operations if required; use of water as required to control dust	Construction site manager	During construction works

6. IMPACT SUMMARY

6.1 SERIOUS AND IRREVERSIBLE IMPACTS

One (1) listed entity at risk of serious and irreversible impacts (SAIL) was recorded within the Subject Land, *Diuris arenaria* (Sand Doubletail). The SAIL assessment for this species was completed in accordance with Subsection 9.1.2 of the BAM, is provided in **Appendix 8**, and summarised below.

***Diuris arenaria* (Sand Doubletail)**

A total of one (1) *Diuris arenaria* (Sand Doubletail) plant was recorded within the Study Area. Following amendments to the proposed Impact Area (removal of northern connection route) impacts to this single plant will now be avoided. While there will be no direct impacts to this species, impacts to suitable habitat for the species is considered as part of an SAIL assessment completed for the species (see **Appendix 8**). The proposal is not expected to result in a serious or irreversible impact to *Diuris arenaria* (Sand Doubletail).

Mahony's Toadlet (*Uperoleia mahonyi*)

The species was recorded at six (6) separate locations within the Study Area including in pitfall traps. In accordance with the NSW Survey Guide for Threatened Frogs "*the species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 400 metres radius from the top of bank of the breeding site*". As such all suitable areas of aquatic habitat within the Subject Land were mapped and a 400 buffer was established from the top of bank. As PCT 3544 is associated with the species areas of this PCT within the 400 m buffer were incorporated into a species polygon for the species.

While the species is not listed as an entity at risk of SAIL an assessment for this species was undertaken upon request of DCCEEW. As such, the requirement for this assessment is based on Section 3.2.1 of the 'Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019), which states: "*It is possible for the decision-maker to consider entities that are not identified in the TBDC as being at risk of a SAIL, but only where they meet one or more of the principles in the BC Regulation*".

While there will be no impacts to core habitat for this species, impacts to suitable habitat within a 400 m buffer was assessed as part of the SAIL assessment completed for the species (see **Appendix 8**). The proposal is not expected to result in a serious or irreversible impact to Mahony's Toadlet.

6.2 IMPACTS REQUIRING OFFSETTING

6.2.1 Impacts on Ecosystem Credit Entities

This section provides an assessment of the impacts requiring offsetting in accordance with Section 10.1 of the BAM (DPIE 2020a).

In accordance with the BAM (Section 9.2.1 [DPIE 2020a]) assessors must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- ≥15, where the PCT is representative of an EEC or a CEEC.

- ≥ 17 , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.
- ≥ 20 , where the PCT does not represent a TEC and is not associated with threatened species habitat.

Impacts on native vegetation and the required ecosystem credits is summarised in **Table 16**.

Table 16 Summary of ecosystem credit requirements

Zone	PCT & Class / Species	Area (ha) No.	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Credits Required
PCT 3544: Coastal Sands Apple-Blackbutt Forest					
1	PCT 3544 (Moderate)	0.74	72.5	0	20
2	PCT 3544 (Shrubby Regen)	1.46	20	0	11
3	PCT 3544 (Managed)	0.69	17.5	0	5
PCT 3544 - Subtotal					36

The Biodiversity Credit Report detailing like-for-like credit retirement options is provided in **Appendix 8**.

6.2.2 Impacts on Species Credit Species

A summary of the impacts on threatened species and the required species credit species is provided in **Table 17**. The Biodiversity Credit Reports are provided in **Appendix 8**.

Table 17 Summary of species credit requirements

Zone	PCT & Class / Species	Area (ha)/Count	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Species Credit Obligation
<i>Diuris arenaria</i> (Sand Doubletail)					
1	PCT 3544 (Moderate)	0.74	72.5	0	40
2	PCT 3544 (Shrubby Regen)	1.46	20	0	22
3	PCT 3544 (Managed)	0.69	17.5	0	9
Subtotal					71
<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> (Earp's Gum)					
1	PCT 3544 (Moderate)	11	0.74	72.5	22
2	PCT 3544 (Shrubby Regen)	0	1.46	20	0
3	PCT 3544 (Managed)	0	0.69	17.5	0
Subtotal					22
<i>Wallum Froglet</i> (<i>Crinia tinnula</i>)					
1	PCT 3544 (Moderate)	0.12	72.5	0	3
2	PCT 3544 (Shrubby Regen)	0.17	20	0	1
3	PCT 3544 (Managed)	0.02	17.5	0	1
Subtotal					5

Zone	PCT & Class / Species	Area (ha)/Count	Current Vegetation Integrity Score	Future Vegetation Integrity Score	Species Credit Obligation
Mahony's Toadlet (<i>Uperoleia mahonyi</i>)					
1	PCT 3544 (Moderate)	0.74	72.5	0	27
2	PCT 3544 (Shrubby Regen)	1.46	20	0	15
3	PCT 3544 (Managed)	0.69	17.5	0	6
Subtotal					48
Squirrel Glider (<i>Petaurus norfolcensis</i>)					
1	PCT 3544 (Moderate)	0.74	72.5	0	27
2	PCT 3544 (Shrubby Regen)	1.46	20	0	15
3	PCT 3544 (Managed)	0	17.5	0	0
Subtotal					42
Koala (<i>Phascolarctos cinereus</i>)					
1	PCT 3544 (Moderate)	0.74	72.5	0	27
2	PCT 3544 (Shrubby Regen)	0	20	0	0
3	PCT 3544 (Managed)	0	17.5	0	0
Subtotal					27

6.3 IMPACTS NOT REQUIRING OFFSETS

The proposal will also result in the following impacts that do not require offsets:

- 1.35 ha of Exotic Grassland,
- 0.92 ha of Existing Infrastructure and Tracks, and

7. ASSESSMENT OF BIODIVERSITY LEGISLATION

7.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

7.1.1 Assessment Requirements

The EPBC Act requires that developments or undertakings that are likely to have a significant impact on MNES be referred for a determination as to whether they are a controlled action that requires approval under the EPBC Act (Section 1.5.1).

Of the nine MNES listed under the Act, the one (1) MNES considered relevant to the Subject Land was potential impacts on marginal habitat for listed threatened species or communities. An assessment of the relevant threatened species databases and an assessment of the likelihood of occurrence of threatened and migratory species is provided in **Appendix 1**.

Threatened species or communities relevant to this assessment include the following:

- *Eucalyptus parramattensis subsp. decadens* (Earps Gum)
- Koala (*Phascolarctos cinereus*)
- New Holland Mouse (*Pseudomys novaehollandiae*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Mahony's Toadlet (*Uperolia mahonyi*)
- Swift Parrot (*Lathamus discolor*)

An assessment of significance was completed for these threatened species in accordance with EPBC Act Matters of National Environmental Significance Significant impact guidelines 1.1 (Department of the Environment [DotE], 2013) (provided in **Appendix 8**).

Impacts to habitat for these species were considered unlikely to be significant. As such, a referral to the Commonwealth Minister for the Environment is not considered necessary.

7.2 BIODIVERSITY CONSERVATION SEPP 2021

Port Stephens LGA is listed in Schedule 2 of the Biodiversity and Conservation SEPP 2021. Therefore, the Study Area is subject to an approved CKPoM, the *Port Stephens Comprehensive Koala Plan of Management (CKPoM)* (PS 2002), any Development Application to PSC will need to be consistent with the requirements of the CKPoM. Assessment of koala habitat values in accordance with the Port Stephens CKPoM is provided below in **Section 7.2.1**.

7.2.1 Port Stephens Comprehensive Koala Plan of Management (CKPoM)

Review of the Koala Habitat Planning Map for the Port Stephens LGA indicates that the Study Area is mapped as either 'Preferred Koala Habitat Link Over Supplementary' or 'Preferred Koala Habitat Link Over Cleared', with large areas of both 'Supplementary Koala Habitat' and 'Preferred Koala Habitat' located to the north and west of the Study Area (**Figure 27**) (PSC 2002).

A site inspection was undertaken to confirm mapping and record occurrence of Koala feed trees (i.e. *Eucalyptus robusta*, *E. parramattensis* and *E. tereticornis*) within the Subject Land. The results of the site inspection revealed that 33 of *E. parramattensis* subsp. *decadens* occur within the Study Area (5 m buffer to allow for GPS accuracy of ± 5 m) with eight (8) being within the Impact Area and an additional three (3) being within 5m of the Impact Area (**Figure 28**).

A vegetation assessment undertaken identified two (2) native plant communities as occurring within the Study Area (**Section 3.2.2**), along with exotic vegetation. The results of the vegetation assessment were then used to defined each vegetation zone based on Community Survey Category, and Field Survey Category, as detailed by Lunney *et al.* (1998) (see results in **Table 18**). The combined Koala habitat map is based on the following classes:

- **Preferred Koala Habitat** – a combination of all field survey Primary, Secondary, and community survey category A/B regardless of whether or not they overlap
- **Supplementary Koala Habitat** – where field survey marginal and community survey category C/D overlap
- **Marginal Koala Habitat** – where field survey Marginal and community survey category E overlap

See existing CKPoM mapping and a site-specific Koala Habitat map in **Figure 27** and **Figure 28**.

Table 18: Classification of Koala habitat within Subject Land

PCT	Vegetation Zones	Community Survey Category	Field Survey (Koala Feed Tree* Comp %)	Proposed Koala Habitat Mapping
PCT 3544	Zone 1	Tall Open Blackbutt and Syd Red Gum F with Scribbly Gum (Category B)	Marginal <10% KFT	'Preferred' Koala Habitat
PCT 3544	Zone 2	Cleared (Mainly cleared land, some trees)	Marginal <10% KFT	'Marginal' Koala Habitat
PCT 3544	Zone 3	Cleared (Mainly cleared land, some trees)	Marginal <10% KFT	'Mainly Cleared'
PCT 3996	Zone 4	Category A	Primary Approx. 50%	Likely 'Preferred' Koala Habitat, however no survey data to determine use by koala
Exotic Grassland	-	Cleared	NA	'Mainly Cleared'

*Preferred Koala Feed Trees: *Eucalyptus tereticornis*, *Eucalyptus robusta*, *Eucalyptus parramattensis* (Lunney *et al.* 1998)

Performance Criteria for development (Appendix 5 of CKPoM)

The performance criteria for the proposed development are addressed below:

Minimise the removal or degradation of native vegetation within Preferred Koala Habitat or Habitat Buffers.

A total of 0.74 ha of 'Preferred' Koala Habitat is proposed for removal. However, 3.86 ha of preferred habitat is being avoided within the Study Area. Once extraction is completed, the (western extension area) property will be rehabilitated to vegetation consistent with it's land current use – mixed open grasslands, scattered trees.

Maximise retention and minimise degradation of native vegetation within Supplementary Koala Habitat and Habitat Linking Areas.

A total of 2.14 ha of 'Preferred Koala Habitat Link Over Cleared Land' will be impacted by the proposed development (Vegetation Zones 2 and 3), while impacts to Exotic Grassland (2.88 ha) constitutes an impact to 'Preferred Koala Habitat Link Over Other Vegetation'. Impact avoidance and minimisation measures have prioritised the retention of higher quality 'Preferred Koala Habitat' within the Study Area, however avoidance of 'Supplementary Koala Habitat' and 'Habitat Linking Areas' are outlined below:

- 'Preferred Koala Habitat Link Over Cleared Land' – Modification impact: 2.15 ha (63%), Avoided impacts within the Study Area: 1.27 ha (37%)
- 'Preferred Koala Habitat Link Over Other Vegetation' – Modification impact: 2.88 ha (36%), Avoided impacts within the Study Area: 5.13 ha (64%)

Impacts to movement corridors are minimised through the staging of extraction. Once extraction is completed, the (western extension area) property will be rehabilitated to vegetation consistent with it's land current use – mixed open grasslands, scattered trees.

Minimise the removal of any individuals of preferred koala food trees, wherever they occur on a development site. In the Port Stephens LGA these tree species are Swamp Mahogany (*Eucalyptus robusta*), Parramatta Red Gum (*Eucalyptus parramattensis*), and Forest Red Gum (*Eucalyptus tereticornis*), and hybrids of any of these species. An additional list of tree species that may be important to koalas based on anecdotal evidence is included in Appendix 8

A total of eleven (11) Koala feed trees (*E. parramattensis subsp. decadens*) will be removed under the current modification, representing 33% of the 33 *E. parramattensis subsp. decadens* recorded within the Study Area. Furthermore, a total of 633 *E. parramattensis subsp. decadens* trees have been recorded within the broader Subject Land and will be retained within the proposed Biodiversity Stewardship Site. While a total of 48 individuals of Swamp Mahogany (*Eucalyptus robusta*) will be retained within the avoided vegetation in the western extension area.

Make provision, where appropriate, for restoration or rehabilitation of areas identified as Koala Habitat including Habitat Buffers and Habitat Linking Areas over Mainly Cleared Land. In instances where Council approves the removal of koala habitat (in accordance with dot points 1-4 of the above waive clause), and where circumstances permit, this is to include measures which result in a "net gain" of koala habitat on the site and/or adjacent land;

Impacts to movement corridors are minimised through the staging of extraction. Once extraction is completed, the (western extension area) property will be rehabilitated to vegetation consistent with

it's land current use – mixed open grasslands, scattered trees, restoring Koala Habitat Linking areas over Mainly Cleared Land. Preferred Koala Feed trees impacted by the proposal will be replaced at a rate of 1:1 (total of eleven [11] plantings).

As such, the proposal is consistent with this objective.

Make provision for long term management and protection of koala habitat including both existing and restored habitat;

The long-term management of the local koala population during operation and restoration of the impact area will be detailed within an updated Newcastle Sand Biodiversity and Rehabilitation Management Plan (NS BRMP). This includes the requirement for ongoing monitoring and detailed performance criteria including achieving '*preferred koala feed trees at a suitable density across rehabilitation area to support koala population*'. With corrective actions being required if '*the feed trees occupy less than 15% of the canopy*'.

Long-term management of the koala population within the broader Subject Land will be secured through the establishment and management of an on-site Biodiversity Stewardship Site.

Not compromise the potential for safe movement of koalas across the site. This should include maximising tree retention generally and minimising the likelihood that the proposal would result in the creation of barriers to koala movement, such as would be imposed by certain types of fencing. The preferred option for minimising restrictions to safe koala movement is that there be no fencing (of a sort that would preclude koalas) associated with dog free developments within or adjacent to Preferred or Supplementary Koala Habitat, Habitat Buffers or Habitat Linking Areas. Suitable fencing for such areas could include:

- i. **fences where the bottom of the fence is a minimum of 200 mm above ground level that would allow koalas to move underneath;**
- ii. **fences that facilitate easy climbing by koalas; for example, sturdy chain mesh fences, or solid style fences with timber posts on both sides at regular intervals of approximately 20 m;**
- iii. **open post and rail or post and wire (definitely not barbed wire on the bottom strand).**

North-south movement corridors are retained through amendments to the proposed Impact Area including the removal of the northern haul road and the retention of vegetation along the northern boundary of the Study Area. Impacts to connectivity resulting from the establishment of the southern haul road were minimised through staging of extraction which will allow a vegetated corridor to be retained while adjacent areas are rehabilitated.

East-west corridors along the northern side of Cabbage Tree Road are retained under the proposed modification.

Any fencing that is required on-site will include koala crossings as per the NS BRMP, where the land borders on other koala habitat. However, fencing is more likely required to prevent movement of koalas from the site onto Cabbage Tree Road, in line with the NS BRMP.

Checklist for development applications

The proposed development contains Preferred (Koala) Habitat, Habitat Buffers and Habitat Linking Areas, and so the following information must be submitted with the development application (see **Table 19**).

Table 19: Checklist of information to accompany development applications.

Information to Accompany Applications (Appendix 4 CKPoM).	Section of report that this has been included
1. An assessment of koala habitat, by a suitably qualified person, in accordance with the attached Guidelines for Koala Habitat Assessment, which appear in Appendix 6.	A list of staff who contributed to this BDAR are included in Appendix I with a description of the qualifications and experience for those who conducted specific assessments in relation to Koala Habitat, showing they are suitably qualified to undertake these assessments.
2. Clear details concerning which vegetation is to be cleared or disturbed and that which is to be retained.	Section 5.2.1 details the vegetation to be cleared with areas detailed in Table 2
3. Details of any proposed building envelopes and fire fuel reduction zones and the means by which they are to be enforced.	N/A
4. Proposed measures to restore or rehabilitate koala habitat, including measures which will result in the net gain of koala habitat.	This is addressed in the above performance criteria
5. Proposed measures to allow the safe movement of koalas across the site including road designs and speed mediation measures, fence construction details where fencing is proposed, and swimming pool specifications.	Safe movement of koalas will be maintained in accordance with the Newcastle Sand Biodiversity Rehabilitation Management Plan.
6. Proposed measures to mitigate the impacts on koalas by dogs.	Ongoing monitoring and management of wild dogs is required in accordance with the Newcastle Sand Biodiversity Rehabilitation Management Plan to protect all wildlife.
7. Details of any proposed program to monitor koalas and koala habitat, during and following development activity on a site. Monitoring programs would not be required for single lot developments. Rather, they would be expected for subdivisions. The following information must be submitted with applications for development on sites that are adjacent to Preferred or Supplementary Habitat, Habitat Buffers or Habitat Linking Areas.	A qualified fauna ecologist is to inspect vegetation on site prior to clearing and remain present on site through the process of clearing vegetation.
8. Proposed measures to mitigate the impacts by dogs on koalas which occupy adjacent habitat. This must include measures (such as education of dog owners, appropriate signs, or restrictions on dog ownership) that reduce the likelihood of domestic dogs straying into koala habitat.	Signage is required, as part of the on-site offset area, surrounding the quarry site, to notify neighbouring landowners that the area is used for conservation. In addition, pest control monitoring and activities are undertaken, including trapping animals and if they are a domestic animal, returning them to their owners. In these ways, the neighbouring landowners are made aware of the importance of keeping their animals within their properties, and not allowing them onto the on-site offset area, and with these measures outlined within the NS BRMP, no further mitigation measures are required.
9. Proposed measures to mitigate the impact on koalas of motor vehicles travelling to the site. This must include appropriate traffic control measures on roads which run through or adjacent to nearby koala habitat and which are subject to increased traffic volumes due to the development on the site.	Addressed in the above performance criteria

Guidelines for Koala Habitat Assessments in the Port Stephens LGA

The Guidelines for Koala Habitat Assessments must be carried out by a person or persons with qualifications and experience in tree species identification and, in the case of assessments of koala habitat utilisation at Step 4, qualifications and experience in biological science and fauna survey and management. This should also include experience in conducting koala surveys. It is necessary that a brief curriculum vitae of each person involved with assessments conducted using these guidelines be appended to the survey report.

Koala Habitat Assessment in the Port Stephens LGA should include the following steps as the minimum acceptable approach.

The following table (**Table 20**) provides a checklist to ensure that all information has been provided as required in Appendix 6 of the PSC CKPoM, to cover the proposed development that is being assessed under Part 4 of the EP&A Act.

Table 20: Guidelines for Koala Assessments being considered under Part 4 of the EP&A Act (Appendix 6 CKPoM).

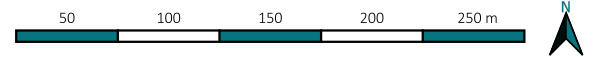
Guidelines for Koala Assessments being considered under Part 4 of the EP&A Act (Appendix 6 CKPoM).	Relevant section of this report
Preliminary Assessment	Existing CKPoM mapping is provided in Figure 27 .
Vegetation Mapping	Site specific vegetation mapping is provided in Figure 6
Koala Habitat Identification	Sections 7.2.1 outlines how koala habitat was determined across the site, while site-specific koala habitat mapping is provided in Figure 28 .
Assessment of the Proposal	Performance Criteria are assessed above



- Classification of Koala Habitat**
- Preferred Koala Habitat
 - Preferred Koala Habitat Buffer Over Mainly Cleared Land
 - Preferred Koala Habitat Link Over Cleared Land
 - Preferred Koala Habitat Buffer Over Marginal Koala Habitat
 - Preferred Koala Habitat Link Over Marginal Koala Habitat

- Subject land
- Impact area
- Arterial Road
- Contour (10m)
- Study area
- Approved quarry

Figure 28: Site Specific Koala Habitat Mapping



Arbus PTY LTD, Mod 4 - Newcastle Sand Cabbage Tree road Williamtown, NSW, 2318



Date: 17/03/2026
 By: Natalia Laws
 GDA94 / MGA zone 56
 Source: © Aerometrex

8. SUMMARY

This Biodiversity Development Assessment Report (BDAR) has been prepared for Williamtown Sand Syndicate Pty Ltd to accompany a modification to the approved Cabbage Tree Road Sand Quarry (SSD-6125) known hereafter as Modification 4 Western Extension (SSD-6125-Mod-4). The proposed modification is located at 398 and 442 Cabbage Tree Road, Williamtown, New South Wales (NSW) (Lot 100/DP 1263921 and Lot 9/DP 239608 respectively) (hereafter "Subject Land").

The proposed modification to SSD-6125 incorporates elements from the withdrawn Modification 3 (SSD-6125-Mod-3) and seeks the following:

- Extension of the extraction area to the west of the existing sand quarry,
- Expansion of existing road corridors for operational purposes.

The proposed modification is driven by an ongoing high demand for construction materials throughout NSW. Available resources to meet this demand are limited, with no currently operating sources of fully graded, premium quality, construction sand in the Sydney Metropolitan area.

A total of two (2) Plant Community Types (PCTs) occur within the Study Area:

- *PCT 3544: Coastal Sands Apple-Blackbutt Forest*
- *PCT 3996: Coastal Sand Swamp Mahogany Dry Forest*

One (1) non-native vegetation zone (Exotic Grassland) also occurs throughout the Study Area. No Threatened Ecological Communities (TECs) are located within the Study Area.

A total of ten (10) threatened species were identified within the Study Area:

- Squirrel Glider (*Petaurus norfolcensis*)
- Wallum Froglet (*Crinia tinnula*)
- Mahony's Toadlet (*Uperoleia mahonyi*)
- *Diuris arenaria* (Sand Doubletail)
- *Eucalyptus parramattensis* subsp. *decadens* (Earp's Gum)
- Southern Myotis (*Myotis macropus*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Little Bent-winged Bat (*Miniopterus australis*)
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*)

One (1) additional threatened fauna species was assumed present;

- Koala (*Phascolarctos cinereus*)

Avoidance and impact minimisation measures for the proposed modification prioritise the retention of areas of high environmental values (HEV) identified within the Study Area (see **Section 5.1**).

A total of three (3) prescribed impacts, as described in Section 8.3 of the BAM 2020, were considered under the proposed modification (see **Section 5**).

Residual impacts to biodiversity values resulting from the modification include:

- *PCT 3544: Coastal Sands Apple-Blackbutt Forest* (Moderate) – 0.74 ha
- *PCT 3544: Coastal Sands Apple-Blackbutt Forest* (Shrubby) – 1.46 ha
- *PCT 3544: Coastal Sands Apple-Blackbutt Forest* (Managed) – 0.69 ha
- Exotic Grassland – 1.35 ha
- *Diuris arenaria* - Sand Doubletail – 2.88 ha
- *Eucalyptus parramattensis subsp. decadens* - Earp's Gum – eleven (11) plants
- *Crinia tinnula* - Wallum Froglet – 0.70 ha
- *Uperoleia mahonyi* - Mahony's Toadlet – 2.88 ha
- *Petaurus norfolcensis* - Squirrel Glider – 2.18 ha
- *Phascolarctos cinereus* – Koala – 0.74 ha

The above impacts considered as part of the SSD to be modified are detailed further in **Section 5**.

One (1) listed Serious and Irreversible Impacts (SII) entity was recorded within the Study Area during targeted surveys; *Diuris arenaria* (Sand Doubletail). One (1) additional species was considered a potential SII entity, Mahony's Toadlet (*Uperoleia mahonyi*). Assessments were completed for both species and it was determined that impacts are unlikely to be significant.

Offsets are required as a result of residual impacts to vegetation and threatened species (and/or their habitat) in accordance with the BAM, including:

- *Coastal Dune Dry Sclerophyll Forests* <50% - **36 credits**
- *Diuris arenaria* (Sand Doubletail) - **71 credits**
- *Eucalyptus parramattensis subsp. decadens* (Earp's Gum) - **22 credits**
- *Crinia tinnula* (Wallum Froglet) - **5 credits**
- *Uperoleia mahonyi* (Mahony's Toadlet) - **48 credits**
- *Petaurus norfolcensis* (Squirrel Glider) - **42 credits**
- *Phascolarctos cinereus* (Koala) - **27 credits**

A total of three (3) threatened species listed under the Commonwealth's EPBC Act will be impacted by the proposed modification including; *Eucalyptus parramattensis subsp. decadens* (Earp's Gum) (vulnerable), Mahony's Toadlet (*Uperoleia mahonyi*) (endangered), and Koala (*Phascolarctos cinereus*) (endangered). Broadly suitable habitat for another three (3) species will also be impacted by the proposed modification, including; New Holland Mouse (*Pseudomys novaehollandiae*), Grey-headed Flying-fox (*Pteropus poliocephalus*), and Swift Parrot (*Lathamus discolor*). The proposed modification is unlikely to result in a significant impact to MNES. As such, a referral to the Commonwealth Minister for the Environment is not considered necessary.

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APPENDIX 1. THREATENED SPECIES DATABASE SEARCH

A list of threatened species, populations and ecological communities that have been reported or modelled to occur from within a five-kilometre radius of the Subject Land was obtained from the following databases:

- NSW DPIE Bionet Atlas: (<http://www.bionet.nsw.gov.au/>); and
- Commonwealth DAWE Protected Matters search tool: (<https://www.environment.gov.au/SPRAT.au/epbc/protected-matters-search-tool>).

Further resources used to inform the threatened species database search included:

- The BAM – Calculator ([BAM Calculator \(nsw.gov.au\)](http://www.bam.nsw.gov.au/));
- NSW DPIE Bionet Threatened Biodiversity Profiles: ([NSW BioNet Quick Guides and Manuals | NSW Environment, Energy and Science](#)); and
- DAWE (2024b). *Species Profile and Threats Database (SPRAT)*. Available at: <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

An assessment was then made of the likelihood of the threatened species, populations, and ecological communities reported or modelled to occur in the locality occurring within the Subject Land or using the habitat within the Subject Land as an essential part of a foraging range.

The table below summarises the likelihood of threatened species and EPBC Act listed migratory species occurring within the Subject Land based on the habitat requirements of each species.

A brief definition of the likelihood of occurrence criteria is provided below:

- **Known** – species identified within the site during surveys;
- **High** – species known from the area (DPIE BioNet Atlas records), suitable habitat (such as roosting and foraging habitat) present within the site;
- **Moderate** – species may be known from the area, potential habitat is present within the site;
- **Low** – species not known from the area and/or marginal habitat is present within the site; and
- **Nil** – habitat requirements not met for this species within the site

Table A1 'Likelihood of Occurrence' Table

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
Flora								
1.	<i>Angophora inopina</i> Charmhaven Apple	V	V	P	PMST	This species is endemic to the central coast region of NSW and is known to occur in four main vegetation communities: Eucalyptus haemastoma / Corymbia gummifera / Angophora inopina woodland / forest; Hakea teretifolia / Banksia oblongifolia wet heath; Eucalyptus resinifera / Melaleuca sieberi / Angophora inopina sedge / woodland; and Eucalyptus capitellata / Corymbia gummifera / Angophora inopina woodland / Forest elegans. Flowering generally poor and sporadic.	No records occur within the locality. Species not identified during field surveys.	Nil
2.	<i>Asperula asthenes</i> Trailing Woodruff	V	V	P	PMST	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. Occurs in damp sites, often along river banks.	No suitable habitat within the Study Area. No records occur within locality. Species not identified during field surveys.	Nil
3.	<i>Caladenia tessellata</i> Thick Lip Spider Orchid	E1,P,2	V	P	PMST	Occurs from Central Coast NSW to southern VIC. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils.	Broadly habitat present within the Impact Area. No records within the locality. The northern extent of this species' range is approximately 40 km south of the Development Site. Species not	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
							identified during field surveys.	
4.	<i>Callistemon linearifolius</i> Netted Bottle Brush	V,3	-	1	BioNet	This shrub grows up to 3-4 m tall, with red flowers that are clustered into the typical "bottlebrushes". The species grows in dry sclerophyll forest on the coast and adjacent ranges.	Known to be associated with PCT3544, with 1 record within 10km search radius (DPIE BioNet Atlas search). Species not identified during field surveys.	Low
5.	<i>Commersonia prostrata</i> Dwarf Kerrawang	E1	E	12	BioNet	Ground-hugging shrub that forms mats to more than 1 m across. Occurs on sandy, sometimes peaty soils in a wide variety of habitats. Distribution limits: Southern Highlands to North Coast (Tomago). (DPIE EPBC). It typically occurs on ecotones between swamp and dry forest. The species need disturbance esuch as fire to germinate.	Known to be associated with PCT3544, and recorded within 10km search radius (DPIE BioNet Atlas search). Species not identified during field surveys.	Low
6.	<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	V,P,2	V	P	PMST	The species occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences for this species are not well defined, however it is known to grow in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with <i>Cryptostylis subulata</i> and <i>Cryptostylis erecta</i> .	Known to be associated with PCT3544. No records occur within locality. Species not identified during field surveys.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
7.	<i>Cynanchum elegans</i> White-flowered Wax Plant	E1	E	0	PMST	The species occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, may also occur in the western part of Gosford LGA. Habitat for the species includes Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.	Known to be associated with PCT3544. No records occur within locality. Species not identified during field surveys.	Low
8.	<i>Diuris praecox</i> Rough Doubletail	V,P,2	V	0	PMST	Occurs between Ourimbah and Nelson Bay on the New South Wales (NSW) north coast. This species has also been identified on the Wallarah Peninsula, near Lake Macquarie in NSW. Grows on hills and slopes of near-coastal districts, in open heathy forests which have a grassy to fairly dense understorey.	Potential habitat within the Development Site. No records within locality.	Low
9.	<i>Eucalyptus camfieldii</i> Camfield's Stringybark	V	V	2270	BioNet	Occurs from Raymond Terrace to Waterfall, with populations known from Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai and the Royal NP. Occurs in exposed situations on sandstone plateaus, ridges and slopes near the coast, often on the boundary of tall coastal heaths or low open woodland. It grows in shallow sandy soils overlying Hawkesbury sandstone.	Recorded (Sept. 2016) in close proximity to the northern boundary. Suitable habitat present on site. Species not identified during field surveys.	Low
10.	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	V	V	1401	BioNet	A woodland tree, up to 15 m in height. Bark sheds in large plates to leave a smooth, granular and mottled white or grey surface. It occurs in dry sclerophyll woodland with dry heath understorey requiring deep, low-nutrient sands.	Records occur within the locality and habitat is present within the Development Site. Several individuals	Known

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
							identified during field surveys.	
11.	<i>Euphrasia arguta</i>	E4A	CE	0	PMST	Known from Nundle State Forest and adjacent private land, in New South Wales. The species is known from three locations in two areas approximately 14 km apart. Occur in eucalypt forest with a mixed grass and shrub understorey within Nundle State Forest.	No suitable habitat within the Development Site. No records in locality. Species not identified during field surveys.	Nil
12.	<i>Grevillea parviflora</i> <i>subsp. parviflora</i> Small-flower Grevillea	V	V	1	BioNet & PMST	The species distribution is between Moss Vale/Bargo and the lower Hunter Valley, with most occurrences in Appin, Wedderburn, Picton and Bargo. The habitat for the species is broad including heath, shrubby woodland and open forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks.	Recorded in proximity to the northern site. Known to be associated with PCT3544. Species not identified during field surveys.	Low
13.	<i>Lindernia alsinoides</i> Noah's False Chickweed	E1	-	1	BioNet	Small annual herb occurring in heath and sclerophyll forest in swampy areas. DPIE.	Recorded within 4km NW of site (Dec. 2009). Marginal suitable habitat within the Development Site. Species not identified during field surveys.	Low
14.	<i>Maundia triglochinoides</i>	V	-	4	BioNet	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, creeks or	Records occur approximately 4km East of site. No suitable habitat within the	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients.	Development Site. Species not identified during field surveys.	
15.	<i>Melaleuca biconvexa</i> Biconvex Paperbark	V	V	0	PMST	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	No records occur in locality, however known to be associated with PCT3802. Species not identified during field surveys.	Low
16.	<i>Persicaria elatior</i> Tall Knotweed	V	V	3	BioNet & PMST	Grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	Records of the species are in the locality. Marginal suitable habitat within the Development Site. Species not identified during field surveys.	Low
17.	<i>Prasophyllum sp.</i> <i>Wybong</i> A Leek-orchid	P	CE	0	PMST	The species occurs within the Sydney Basin, New England Tablelands, Brigalow Belt South and NSW South Western Slopes IBRA Bioregions and the Border Rivers–Gwydir, Namoi, Hunter–Central Rivers and Central West Natural Resource Management Regions. The distribution of this species overlaps with the White Box–Yellow Box–Blakely's Red Gum Grassy Woodland and Derived Native Grassland EPBC Act-listed threatened ecological community.	No records within the locality, No suitable habitat within the Development Site.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
18.	<i>Rhizanthella slateri</i> Eastern underground Orchid	E2,V,P,2	E	0	PMST	The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available. Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	Possible association with PCT3544. No records within locality. Species not identified during surveys.	Low
19.	<i>Rhodamnia rubescens</i> Scrub Turpentine	E4A	CE	0	PMST	Shrub or small tree to 25 m high found in rainforest and riparian vegetation along the coast and up to 600 m ASL. Flowers in late winter through to spring, with a peak in October, and fruits typically begin to appear in December in the Sydney region. Distribution limits N-Tweed Heads S-Batemans Bay. DPIE EPBC.	No records with locality. No suitable habitat within Development Site due to lack of rainforest and wet sclerophyll forest. No further assessment required.	Nil
20.	<i>Rhodomyrtus psidioides</i> Native Guava	E4A	CE	0	PMST	Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Distribution N – Maryborough Qld, S – Broken Bay NSW. DPIE EPBC.	No records within the locality. Marginal suitable habitat within the Development Site. Species not recorded during field surveys.	Low
21.	<i>Syzygium paniculatum</i> Magenta Lilly Pilly	E1	V	0	PMST	The species occurs in a narrow coastal strip from Bulahdelah to Conjola State Forest. Rainforest on sandy soils or stabilised	No records within the locality. Marginal suitable	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests. Plants produce white flower-clusters at the end of each branch is the preferred habitat for this species. The petals are small accompanied by prominent long stamens.	habitat within the Development Site. Species not recorded during field surveys.	
22.	<i>Tetralthea juncea</i> Black-eyed Susan	V	V	0	PMST	Regarded as extinct within the Sydney area, current range from Wyong north to Bulahdelah and inland 50km to edge of Sugarloaf Range. Occurs predominately in areas of over 1000 mm annual rainfall, within dry sclerophyll forest, and sometimes heath and moist forest, with a preference for Coastal Plains Smooth-barked Apple Woodland and Coastal Plains Scribbly Gum Woodland.	No records in locality. However potential habitat within the Development Site. Associated with PCT3544 which occurs on site. Species not identified during field surveys.	Low
23.	<i>Thesium australe</i> Austral Toadflax	V	V	0	PMST	The species occurs in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Habitat for this species includes grassland on coastal headlands or grassland and grassy woodland away from the coast.	No records in occur within locality, however potential habitat occurs within the Development Site. Species not identified during field surveys.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
Amphibians								
1.	<i>Crinia tinnula</i> Wallum Froglet	V	-	78	BioNet	Found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgeland and wet heathlands under leaf litter, vegetation and other debris. In NSW the species extends from north of the Queensland border south to Kurnell. Breeding occurs in colder months.	Known records within Development Site (DPIE BioNet Atlas search). Associated with PCT3544 which occurs on site. Potential suitable habitat available on site.	Known Identified onsite during targeted surveys. (08/05/2024)
2.	<i>Litoria aurea</i> Green and Golden Bell Frog	E	V	3	BioNet & PMST	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Prefers sites containing cumbungi (<i>Typha</i> spp.) or spike rushes (<i>Eleocharis</i> spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. <i>Gambusia holbrooki</i> is a key threat as they feed on green and Golden Bell Frog eggs and tadpoles.	No suitable habitat within the Development Site. Some records of the species in the locality.	Low
3.	<i>Mixophyes balbus</i> Stuttering Frog	E	V	0	PMST	The species occurs along the east coast of Australia. Habitat for the species includes rainforest and wet, tall, open forest, sheltering in deep leaf litter and thick understorey vegetation on the forest floor. Within Sydney Basin the species is now confined to populations in the Watagan Mountains, the southern Blue Mountains and Macquarie Pass. The species does not occur in areas where the	No suitable habitat within the Development Site. No records of the species in the locality.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						riparian vegetation has been disturbed or where there have been significant upstream human impacts.		
4.	<i>Uperoleia mahonyi</i> Mahony's Toadlet	E	E	71	BioNet & PMST	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, also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Distribution limit: N-Seal Rocks S-Kangy Angy (to date)	Known records within Development Site (DPIE BioNet Atlas search). Suitable foraging habitat on site.	Known Identified onsite during targeted surveys. (01/02/2024 – 03/02/2024)
Birds								
1.	<i>Anthochaera phrygia</i> Regent Honeyeater	E	CE	0	PMST	In NSW the species is confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks are seen occasionally in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests. Habitat for the species includes dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.	No records occur within locality. Marginal suitable habitat available on site.	Low
2.	<i>Ardenna carneipes</i> Flesh-footed Shearwater	V	J,K	0	PMST	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia.	No records occur within locality. No suitable habitat on Development Site.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
3.	<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	V	-	2	BioNet	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland. The Tasmanian breeding population migrates north during the cooler months and can be found in southeast NSW. The species is an aerial forager and prefers woodland habitats.	Two known records within locality (DPIE BioNet Atlas search). Potential suitable habitat on site.	Moderate
4.	<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E	31	BioNet & PMST	The species is widespread but uncommon over most NSW except the northwest. Habitat for the species includes permanent freshwater wetlands with tall dense reedbeds particularly Typha spp. and Eleocharis spp, with adjacent shallow, open water for foraging. Roosting occurs during the day amongst dense reeds or rushes and feeding occurs mainly at night.	Recorded within the locality however there is no suitable habitat within the Development Site.	Nil
5.	<i>Calidris ferruginea</i> Curlew Sandpiper	E	CE,C,J, K	30	BioNet & PMST	The species occurs along the entire coast of NSW, particularly in the Hunter Estuary, and freshwater wetlands in the Murray-Darling Basin. Breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales	Records occur within the Hunter Estuary 2 km south of the Development Site. However, no suitable habitat was identified within the Development Site.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						can be found mainly in intertidal mudflats of sheltered coasts.		
6.	<i>Calidris tenuirostris</i> Great Knot	V	CE,C,J, K	0	PMST	In NSW, occurs in scattered sites along the coast to Narooma – it has been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	No records occur within the locality. No suitable habitat within the Development Site.	Nil
7.	<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo	V	E	0	PMST	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (<i>Eucalyptus pauciflora</i>) woodland and occasionally in temperate rainforests.	No records occur within locality. Marginal suitable habitat present within the Development Site.	Low
8.	<i>Calyptorhynchus lathami lathami</i> South-eastern Glossy Black-Cockatoo	V	V	2	BioNet & PMST	Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of Allocasuarina species. Prefers woodland and open forests, rarely away from Allocasuarina. Roost in leafy canopy trees, preferably eucalypts, usually <1 km from feeding site. Nests in large (approx. 20 cm) hollows in trees, stumps or limbs, usually in Eucalypts.	Records occur within proximity to the north of the Development Site. Low number of Allocasuarina species present within the development footprint. No	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
							suitable hollows on site.	
9.	<i>Charadrius mongolus</i> Lesser Sand-plover	V	E,C,J,K	1	BioNet & PMST	Found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.	Recorded within the locality however there is no suitable habitat within the Development Site	Nil
10.	<i>Circus assimilis</i> Spotted Harrier	V	-	6	BioNet	Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn).	No recent records within the locality (Jun 1992). Marginal suitable habitat available within Development site.	Low
11.	<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	V	-	0	PMST	Small grey-brown bird with black streaking on the lower breast/belly and black bars on the undertail. Inhabits Box-Gum woodlands and dry open forest of inland slopes and plains. Preferred woodlands dominant by stringybarks or other rough-barked eucalypts. Forages in trees and on the ground. Endemic to eastern Australia, occurring from the coast to inland plains and western slopes of the great dividing range. Nests in tree or stump hollows greater than 6cm.	No records occur within locality. Marginal suitable habitat within Development Site.	Low
12.	<i>Diomedea antipodensis</i>	V	V	0	PMST	A large Albatross species, with breeding confined to New Zealand, the species ranges	No records within the locality. No	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
	Antipodean Albatross					across the southern Pacific Ocean, east to the coast of Chile and west to eastern Australia. This species regularly occurs in small numbers off the NSW south coast from Green Cape to Newcastle during winter where they feed on cuttlefish.	suitable habitat on site.	
13.	<i>Diomedea exulans</i> Wandering Albatross	E	E	0	PMST	Visits Australian waters extending from Fremantle, Western Australia, across the southern water to the Whitsunday Islands in Queensland between June and September. The species has the largest wingspan of all albatross measuring up to 3.5 m.	No records within the locality. No suitable habitat on site.	Nil
14.	<i>Dromaius novaehollandiae</i> Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	E	-	23	BioNet	Occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. Breeding occurs in late autumn and winter	Records occur within 3-4km to the East and South East of the Development Site (Mar 2021). Marginal suitable habitat on site.	Low
15.	<i>Ephippiorhynchus asiaticus</i> Black-necked Stork	E1	-	20	BioNet	Primarily inhabits permanent freshwater wetlands and surrounding vegetation including swamps, floodplains, watercourses and billabongs, freshwater meadows, wet heathland, farm dams and shallow floodwaters. Will also forage in inter-tidal shorelines, mangrove margins and estuaries. Feeds in shallow, still water. This species breeds during summer, nesting in or near a freshwater swamp.	Records occur within the locality, however no suitable habitat on site.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
16.	<i>Epthianura albifrons</i> White-fronted Chat	V	-	122	BioNet	Short slender bill, long spindly legs, a short square-tipped tail and rounded wings. Detectable all year, gregarious species, usually found foraging on bare or grassy ground in wetland areas. Essential habitat as per vegetation type.	Records occur within the locality, however no suitable habitat on site.	Low
17.	<i>Erythroriorchis radiatus</i> Red Goshawk	E	V	0	PMST	Inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	Marginal habitat within the Development Site. Closest record is approximately 34 km south west to the Development Site.	Nil
18.	<i>Falco hypoleucos</i> Grey Falcon	V	V	0	PMST	Medium-sized, compact, pale falcon with a heavy, thick-set, deep-chested appearance. The species is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. 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.	No suitable habitat in the Development Site, and species not known from the locality.	Nil
19.	<i>Glossopsitta pusilla</i> Little Lorikeet	V	-	6	BioNet	The species occurs from the coast to western slopes of the Great Dividing Range and inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs,	Records occur within locality (Apr 2022). Associated with PCT3544 which occurs on site. Potential	Moderate

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands <i>Eucalyptus albens</i> and <i>E. melliodora</i> are particularly important food sources for pollen and nectar respectively. Mostly nests in small (opening approx. 3cm) hollows in living, smooth-barked eucalypts, especially <i>Eucalyptus viminalis</i> , <i>E. blakelyi</i> and <i>E. dealbata</i> . Most breeding records are from the western slopes.	suitable habitat on site.	
20.	<i>Grantiella picta</i> Painted Honeyeater	V	V	-	PMST	The species is nomadic, occurring in low densities across most of NSW. Highest concentrations and almost all breeding occur on inland slopes of the Great Dividing Range. Habitat for the species includes Boree, Brigalow and Box Gum woodlands and Box-Ironbark forests.	No records occur within locality. No suitable habitat occurs on the Development Site.	Nil
21.	<i>Haematopus longirostris</i> Pied Oystercatcher	E	-	1	BioNet	Scattered along NSW coast. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide. Nests mostly on coastal or estuarine beaches; occasionally saltmarsh or grassy areas.	Records occur within the locality, however no suitable habitat on site.	Nil
22.	<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	V	-	163	BioNet	The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. Feed mainly on fish and freshwater turtles, but also	Known records occur in the locality. However, species was not identified during surveys.	High

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						waterbirds, reptiles, mammals and carrion. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass.		
23.	<i>Hieraaetus morphnoides</i> Little Eagle	V	-	4	BioNet	Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	Known records occur in the locality (Sept 2019). Potential aerial foraging habitat above Development Site. No nests recorded within the Study Area. Species was not identified during targeted surveys.	Low-moderate
24.	<i>Hirundapus caudacutus</i> White-throated Needletail	-	V,C,J,K	17	BioNet & PMST	Widespread in eastern and south-eastern Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	Potential aerial foraging habitat above Development Site; however, it is considered unlikely for this species to be present within the Development Site.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
25.	<i>Lathamus discolor</i> Swift Parrot	E	CE	5	BioNet & PMST	A migratory species that travels to the mainland from March to October, the species breeds in Tasmania from September to January. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. Eucalyptus robusta, Corymbia maculata and C. gummifera dominated coastal forests are also important habitat.	Potential foraging opportunities within canopy due to the presence of <i>E. haemastoma</i> . Species is known to the locality.	Low-moderate
26.	<i>Limicola falcinellus</i> Broad-billed Sandpiper	V	C,J,K	0	PMST	Favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs. Diet includes insects, crustaceans, molluscs, worms and seeds.	No records occur within the locality. No suitable habitat within the Development Site.	Nil
27.	<i>Limosa limosa</i> Black-tailed Godwit	V	C,J,K	8	BioNet & PMST	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. It is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. It has also been found around muddy lakes and swamps, wet fields and sewerage treatment works.	There are some records within the locality however, there is no suitable habitat within the Development Site.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
28.	<i>Lophoictinia isura</i> Square-tailed Kite	V	-	1	BioNet	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Breeding is from July to February.	Records occur within 7km NW of the Development Site. Marginal suitable habitat available on site. However, species was not identified during surveys.	Low-moderate
29.	<i>Melanodryas cucullata cucullata</i> Hooded Robin (south-eastern form)	V	-	0	PMST	Widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. The south-eastern form (subspecies <i>cucullata</i>) is found from Brisbane to Adelaide and throughout much of inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	No records in the locality. Habitat is potentially suitable for the species.	Low.
30.	<i>Ninox strenua</i> Powerful Owl	V	-	10	BioNet	Occurs from the coast to the western slopes. Solitary and sedentary species. Inhabits a range of habitats from woodland and open sclerophyll forest to tall open wet forest and rainforest. Prefers large tracts of vegetation. Nests in large tree hollows (> 0.5 m deep), in large eucalypts (dbh 80-240 cm) that are at least 150 years old. Pairs have high fidelity to a small number of hollow-bearing nest trees and defend a large home range of 400 - 1,450	Records occur within 1km to the North of the Development Site. Field surveys found no suitable large hollows occur within the development footprint. Suitable	Moderate

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						ha. Forages within open and closed woodlands as well as open areas.	habitat within the surrounding area.	
31.	<i>Numenius madagascariensis</i> Eastern Curlew	-	CE,C,J,K	11	BioNet & PMST	The eastern curlew is Australia's largest shorebird and a long-haul flyer. It is easily recognisable, with its long, down-curved bill. The species takes an annual migratory flight to Russia and northeastern China to breed, arriving back home to Australia in August.	Recorded within the locality however there is no suitable habitat within the Development Site.	Nil
32.	<i>Pandion cristatus</i> Eastern Osprey	V	-	6	BioNet & PMST	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. 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.	This species was observed roosting in proximity to the Development Site in 2011. However, the species was not identified during surveys.	High
33.	<i>Ptilinopus magnificus</i> Wompoo Fruit-Dove	V	-	1	BioNet	Occurs from Hunter River to Cape York, but rare south of Coffs Harbour. No recent records from Illawarra where it once occurred. Inhabits rainforest, low elevation moist eucalypt forest and brush box forests, mostly in mature forest but also remnant and regenerating rainforest. Feeds on fruit and is locally nomadic following food availability. Builds nest platform on thin branch or palm frond, often over water, usually 3-10m above ground.	One record occurs within the locality, however no suitable habitat within the Development Site	Nil
34.	<i>Pycnoptilus floccosus</i> Pilotbird	-	V	0	PMST	Pilotbirds are small terrestrial ground-dwelling birds, living on the ground in dense forests with heavy undergrowth. Critical habitat includes wet sclerophyll forests in temperate zones in moist gullies with dense undergrowth, and dry	No suitable habitat within the Development Site	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						sclerophyll forests and woodlands occupying dry slopes and ridges. Lowland Pilotbirds occur in forests from the Blue Mountains west of Newcastle, around the wetter forests of eastern Australia, to Dandenong near Melbourne.		
35.	<i>Rostratula australis</i> Australian Painted Snipe	E	E	0	PMST	Normally found in permanent or ephemeral shallow inland wetlands, either freshwater or brackish. The species nests on the ground amongst tall reed-like vegetation near water. Habitat for the species includes the fringes of swamps, dams and nearby marshy areas with cover of grasses, lignum, low scrub or open timber.	Species has been recorded approximately 10 km south of the Development Site at Kooragang Island. No suitable habitat within the Development Site.	Nil
36.	<i>Stagonopleura guttata</i> Diamond Firetail	V	-	0	PMST	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum (<i>Eucalyptus pauciflora</i>) 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. Groups separate into small colonies to breed, between August and January.	No records occur within the locality. Associated with PCT3544 which occurs on site.	Low
37.	<i>Thalassarche bulleri</i> Buller's Albatross	-	V	0	PMST	Abundant, small albatross occurring around coastal areas of New Zealand. During the breeding season it is commonly found in seas off the South Island and off south-eastern Australia.	No records occur within the locality. No suitable habitat within the Development Site.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
38.	<i>Thalassarche salvini</i> Salvin's Albatross	-	V	0	PMST	Large albatross, with a wingspan of 212–256 cm. The species is predominately marine occurring in subantarctic and sub-tropical waters. The breeding biology of Salvin's Albatross is poorly known.	No records occur within the locality. No suitable habitat within the Development Site.	Nil
39.	<i>Tyto longimembris</i> Eastern Grass Owl	V	-	11	BioNet	Recorded occasionally in all mainland states of Australia but are most common in northern and north-eastern Australia. In NSW they are more likely to be resident in the north-east. The species is found in areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains.	Records occur within 4km to the South West of the site (Jul 2012). However, marginal suitable habitat available within the Development Site.	Low
40.	<i>Tyto novaehollandiae</i> Masked Owl	V	-	5	BioNet	Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.	Records occur within the locality. Marginal suitable habitat available within the Development Site.	Low
Mammals								
1.	<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	V	V	0	PMST	The species occurs from the coast to the western slopes of the divide. The largest numbers of records are from sandstone escarpment country in the Sydney Basin and	Potential foraging habitat present within the Development Site.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						Hunter Valley. The species roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.	No caves within 2km. No records within the locality.	
2.	<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V	E	2	BioNet & PMST	Found in eastern NSW, eastern Victoria, south-east and north-eastern Queensland, and Tasmania the species has been 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	Marginal habitat present within the Development Site. The closest record was made in 2019 approximately 6.5km North West of the Development Site.	Low
3.	<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	V	-	3	BioNet	The species occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts include hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12km foraging movements recorded).	Three records occur within the locality. No suitable habitat within the Development Site.	Low
4.	<i>Micronomus norfolkensis</i> Eastern Coastal Free-tailed Bat	V	-	8	BioNet	Inhabits open forests and woodlands foraging above the canopy and along the edge of forests. Roosts in tree hollows, under bark and buildings. Distribution limit: N-Woodenbong. S-Pambula. (DPIE).	Several records occur within the locality. Although field surveys found limited to no hollows for roosting,	Low-moderate

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
							potential suitable foraging habitat occurs within the Development Site.	
5.	<i>Miniopterus australis</i> Little Bent-winged Bat	V	-	16	BioNet	The species occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Outside breeding season roosts in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. Forages for insects beneath the canopy of well-timbered habitats.	Potential foraging habitat within the Development Site with some records within locality.	Moderate
6.	<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat	V	-	10	BioNet	Prefers areas where there are caves, old mines, old buildings, stormwater drains and well-timbered areas. Distribution limit: N-Border Ranges National Park. S-South of Eden. DPIE.	Potential foraging habitat within the Development Site with some records within locality	Moderate
7.	<i>Myotis macropus</i> Southern Myotis	V	-	5	BioNet	Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in	Some records in locality, however no suitable waterbodies for foraging occur within the development site.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						close proximity to water. The breeding period for this species is November or December.		
8.	<i>Notamacropus parma</i> Parma Wallaby	V	V	0	PMST	Inhabits rainforests and wet and dry sclerophyll forests with a dense understorey and associated grassy patches. Distribution limit: N-Border Ranges National Park. S-Morton National Park. DPIE.	No records occur within the locality. No suitable habitat occurs within the Development Site.	Nil
9.	<i>Petauroides volans</i> Southern Greater Glider	E	E	0	PMST	The species occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Occupy a relatively small home range with an average size of 1 to 3 ha.	No records within the locality. Marginal suitable habitat within the Development Site.	Nil
10.	<i>Petaurus australis</i> Yellow-bellied Glider	V	V	0	PMST	Found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Very mobile species known to occupy large home ranges between 20 to 85 ha.	No records within the locality. Marginal suitable habitat within the Development Site.	Nil
11.	<i>Petaurus norfolcensis</i> Squirrel Glider	V	-	25	BioNet	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum Forest west of the Great Dividing Range and Blackbutt-Bloodwood Forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey.	Known to the locality. Suitable hollows not located during field surveys; however potential foraging habitat occurs within the Development Site.	Known. Identified onsite during targeted surveys.

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
12.	<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	V	-	3	BioNet	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Mating occurs May – July.	Recorded 6km to Northwest of the Development Site (Jul 2006). Potential suitable habitat within the development site. Species not identified during targeted surveys.	Moderate.
13.	<i>Phascolarctos cinereus</i> Koala	E	E	693	BioNet & PMST	Fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Potential foraging opportunities within the Impact Area, records within the locality. Species not identified during targeted surveys.	Known.
14.	<i>Planigale maculata</i> Common Planigale	V	-	1	BioNet	Occupies coastal north-eastern NSW, coastal east Queensland and Arnhem Land. The species reaches its confirmed southern distribution limit on the NSW lower north coast. Common Planigales inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water.	Limited potential habitat within the Development Site. One record within the locality. Species not identified during targeted surveys.	Low.
15.	<i>Potorous tridactylus</i> Long-nosed Potoroo	V	V	1	BioNet & PMST	Restricted to east of the Great Dividing Range, with annual rainfall >760 mm. Inhabits coastal heath and dry and wet sclerophyll forests.	Potential suitable habitat within the Development Site.	Low

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						Requires relatively thick ground cover and appears restricted to areas of light and sandy soil. Feeds on fungi, roots, tubers, insects and their larvae, and other soft-bodied animals in the soil.	Only one old record (Sept 2009) within the locality, 4km to the East of the Development Site. Not recorded during targeted surveys.	
16.	<i>Pseudomys novaehollandiae</i> New Holland Mouse	-	V	64	BioNet & PMST	The species occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW it inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes. Species presence is strongly correlated with understorey vegetation density, and high floristic diversity in regenerating heath.	Potential habitat within the Development Site. Records within the locality.	High
17.	<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	35	BioNet & PMST	Generally, this species is found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. Inhabit subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Potential foraging within canopy. Records occur within locality. Identified foraging on-site during spotlighting surveys. No breeding camps present within Development Site. Species identified onsite during targeted surveys.	Moderate-high.

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
18.	<i>Saccolaimus flaviventris</i> Yellow-bellied Sheath-tail-bat	V	-	4	BioNet	Migrates from tropics to SE Aus in summer. Forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. Seasonal movements are unknown.	Potential foraging habitat occurs within Development Site. Records occur within the locality.	Moderate-high
19.	<i>Scoteanax rueppellii</i> Greater Broad-nosed Bat	V	-	11	BioNet	The species is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however, does not occur at altitudes above 500 m. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks.	Marginal suitable habitat occurs within Development Site, with species foraging along creek and river corridors and preferring wet sclerophyll and rainforest habitat. Records occur within locality.	Low
Migratory Terrestrial Species								
1.	<i>Apus pacificus</i> Fork-tailed Swift	-	C,J,K	P	PMST	The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. They mostly occur over inland plains but sometimes above foothills or in coastal areas.	No suitable habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Low
2.	<i>Ardenna carneipes</i> Flesh-footed Shearwater	V,P	J,K	P	PMST	Ranges throughout the Pacific and Indian Oceans. There are two main breeding areas in the world: one in the South West Pacific includes Lord Howe Island and New Zealand; the other along the coast of Western Australia.	No suitable habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
3.	<i>Calidris tenuirostris</i> Great Knot	V	CE,C,J,K	P	PMST	In NSW, occurs in scattered sites along the coast to Narooma – it has been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	No habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Nil
4.	<i>Charadrius mongolus</i> Lesser Sand-plover		E,C,J,K	P	PMST	Found around the entire coast but is most common in the Gulf of Carpentaria, and along the east coast of Queensland and northern NSW. Almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms.	No habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Nil
5.	<i>Cuculus optatus</i> Oriental Cuckoo	-	C,J,K	P	PMST	Mainly inhabits forests, occurring in coniferous, deciduous and mixed forest. It feeds mainly on insects and their larvae, foraging for them in trees and bushes as well as on the ground.	No habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Low
6.	<i>Hirundapus caudacutus</i> White-throated Needletail	-	V,C,J,K	P	PMST	Widespread in eastern and south-eastern Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground.	Broadly suitable habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Low
7.	<i>Limicola falcinellus</i>	V	C,J,K	0	PMST	Favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours,	Broadly suitable habitat within the	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
	Broad-billed Sandpiper					embayments, lagoons, saltmarshes and reefs. Diet includes insects, crustaceans, molluscs, worms and seeds.	Study Area. No records within the locality. Not recorded during site assessment.	
8.	<i>Limosa lapponica</i> Bar-tailed Godwit	-	C,J,K	1,P	BioNet PMST	Bar-tailed Godwits are quite large waders, with females being bigger than males. The Bar-tailed Godwit is mainly mottled brown above and lighter and more uniform buff below. The species arrives in Australia each year in August from breeding grounds in the northern hemisphere. The species is known to inhabit estuarine mudflats, mangroves and beaches.	No habitat within the Study Area. Records within the locality. Not recorded during site assessment.	Nil
9.	<i>Limosa limosa</i> Black-tailed Godwit	V	C,J,K	P	PMST	The Black-tailed Godwit is a migratory wading bird that breeds in Mongolia and Eastern Siberia and flies to Australia for the southern summer, arriving in August and leaving in March. In NSW, it is most frequently recorded at Kooragang Island (Hunter River estuary), with occasional records elsewhere along the north and south coast, and inland. Records in western NSW indicate that a regular inland passage is used by the species, as it may occur around any of the large lakes in the western areas during summer, when the muddy shores are exposed. It is usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. It has also been found around muddy lakes and swamps, wet fields and sewerage treatment works.	No habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
10.	<i>Motacilla flava</i> Yellow Wagtail	-	C,J,K	P	PMST	The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops.	Broadly suitable habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Low
11.	<i>Numenius madagascariensis</i> Eastern Curlew	-	CE,C,J, K	2,P	BioNet PMST	The eastern curlew is Australia's largest shorebird and a long-haul flyer. It is easily recognisable, with its long, down-curved bill. The species takes an annual migratory flight to Russia and northeastern China to breed, arriving back home to Australia in August.	No habitat within the Study Area. Records within the locality. Not recorded during site assessment.	Nil
Migratory Wetland Species								
1.	<i>Calidris acuminata</i> Sharp-tailed Sandpiper	-	C,J,K	1	BioNet PMST	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No habitat within the Study Area. One record within the locality. Not recorded during site assessment.	Nil
2.	<i>Calidris ferruginea</i> Curlew Sandpiper	E	CE,C,J, K	12	BioNet PMST	The species occurs along the entire coast of NSW, particularly in the Hunter Estuary, and freshwater wetlands in the Murray-Darling Basin. Breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales can	No habitat within the Study Area. Records within the locality. Not recorded during site assessment.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						be found mainly in intertidal mudflats of sheltered coasts.		
3.	<i>Calidris melanotos</i> Pectoral Sandpiper	-	J,K	P	PMST	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Nil
4.	<i>Gallinago hardwickii</i> Latham's Snipe	-	J,K	4,P	BioNet PMST	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level.	No habitat within the Study Area. No records within the locality. Not recorded during site assessment.	Nil
5.	<i>Tringa brevipes</i> Grey-tailed Tattler	-	C,J,K	P,1	BioNet PMST	Occurs along most of the coast from QLD border, south to Tilba Lake. It is more heavily distributed along coastal regions north of Sydney. Found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. Most abundant in areas with dense beds of seagrass. Occasionally found around near-coastal wetlands, such as lagoons and lakes and ponds in sewage farms. Forages in shallow water, on hard intertidal substrates, such as reefs and rock platforms. Roosts in the branches of mangroves or, rarely, in dense stands of other shrubs, or on snags or driftwood. (DCCEEWS PRAT)	No habitat within the Study Area. Records within the locality. Not recorded during site assessment.	Nil
6.	<i>Tringa nebularia</i> Common Greenshank	-	C,J,K	2	BioNet	Found in a wide variety of inland wetlands and sheltered coastal habitats (with large mudflats and saltmarsh, mangroves or seagrass) of	No habitat within the Study Area.	Nil

No.	Species	Legal Status*		Records**	Source#	Habitat Preferences	Summary	Likelihood of occurrence
		BC Act	EPBC Act					
						varying salinity, Habitats include embayments, harbours, river estuaries, deltas and lagoons. It uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. Also artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. In NSW the Hunter River estuary has been identified as a site of international importance. Breeds in Eurasia, the northern British Isles, Scandanavia, east Estonia and north-east Belarus, through Russia and east.	Records within the locality. Not recorded during site assessment.	

* Status. *Biodiversity Conservation Act 2016* (BC), *Environment Protection and Biodiversity Conservation Act 1999* (EPBC), M (Migratory), V (Vulnerable), E (Endangered), CE (Critically Endangered), E3 (Endangered Ecological Community), E4B (Critically Endangered Ecological Community)

** Records. # (number of records within locality), P (Predicted), K (known to occur with the locality).

*** Source. Bionet (NSW Department of Planning and Environment (DPE) BioNet Atlas), PMST (Protected matter database search tool).

APPENDIX 2. FLORA SPECIES LIST

Table 2A Flora Species List

Family	Scientific Name	Plot ID	Q01		Q2		Q3		Q04		Q05	
		BAM Growth Form / High Threat Weeds	C	Ab	C	Ab	C	Ab	C	Ab	C	Ab
Apiaceae	<i>Actinotus helianthi</i>	Forb (FG)	0.1	20	0.1	5	0.1	1	0.1	5	0.1	10
Apiaceae	<i>Platysace ericoides</i>	Shrub (SG)	1	50	0.1	10	0.1	1			0.2	20
Apocynaceae	<i>Parsonsia straminea</i>	Other (OG)					1	2				
Asteraceae	<i>Ozothamnus diosmifolius</i>	Shrub (SG)							0.1	1		
Bignoniaceae	<i>Pandorea pandorana</i>	Other (OG)					0.1	5				
Casuarinaceae	<i>Allocasuarina littoralis</i>	Tree (TG)	0.1	1	0.1	1						
Commelinaceae	<i>Tradascantia fluminensis</i>	Exotic										
Cyperaceae	<i>Schoenus ericetorum</i>	Grass & grasslike (GG)	0.1	10	0.2	50	0.1	1	0.1	2	0.1	5
Dennstaedtiaceae	<i>Pteridium esculentum</i>	Fern (EG)	1	100					0.1	5		
Dilleniaceae	<i>Hibbertia fasciculata</i>	Shrub (SG)			0.1	20			0.1	5	1	100
Dilleniaceae	<i>Hibbertia linearis</i>	Shrub (SG)	0.5	50	0.2	50			0.1	5	1	100
Ericaceae	<i>Astroloma pinifolium</i>	Shrub (SG)	1	50	0.2	5			0.1	3	1	100
Ericaceae	<i>Leucopogon appressus</i>	Shrub (SG)									0.5	50
Ericaceae	<i>Leucopogon ericoides</i>	Shrub (SG)	0.1	20	0.2	20	0.1	2	0.1	5		
Ericaceae	<i>Monotoca elliptica</i>	Shrub (SG)			0.2	10			0.1	5	15	100
Ericaceae	<i>Monotoca elliptica</i>	Shrub (SG)	40	100	0.2	10	20	20				
Ericaceae	<i>Monotoca scoparia</i>	Shrub (SG)							0.1	10		
Euphorbiaceae	<i>Amperea xiphoclada</i> var. <i>xiphoclada</i>	Shrub (SG)			0.1	2	0.1	5				
Euphorbiaceae	<i>Ricinocarpos pinifolius</i>	Shrub (SG)	2	20	0.2	10	0.1	1				
Fabaceae (Faboideae)	<i>Aotus ericoides</i>	Shrub (SG)	2	20	0.1	2	0.2	2				
Fabaceae (Faboideae)	<i>Bossiaea heterophylla</i>	Shrub (SG)	2	20	0.1	10						
Fabaceae (Faboideae)	<i>Bossiaea rhombifolia</i>	Shrub (SG)	2	20					0.1	1	7	200
Fabaceae (Faboideae)	<i>Daviesia ulicifolia</i>	Shrub (SG)	2	20	0.1	5						

Family	Scientific Name	Plot ID	Q01		Q2		Q3		Q04		Q05	
		BAM Growth Form / High Threat Weeds	C	Ab	C	Ab	C	Ab	C	Ab	C	Ab
Fabaceae (Faboideae)	<i>Dillwynia retorta</i>	Shrub (SG)			0.5	10	0.1	2				
Fabaceae (Faboideae)	<i>Hardenbergia violacea</i>	Other (OG)	0.1	5								
Fabaceae (Mimosoideae)	<i>Acacia longifolia</i>	Shrub (SG)	7	20	2	20	1	2	0.1	1	1	50
Fabaceae (Mimosoideae)	<i>Acacia terminalis</i>	Shrub (SG)	0.2	2								
Fabaceae (Mimosoideae)	<i>Acacia ulicifolia</i>	Shrub (SG)	1	20	0.1	5	0.2	5				
Hypoxidaceae	<i>Hypoxis hygrometrica</i> var. <i>hygrometrica</i>	Forb (FG)										
Lauraceae	<i>Cassytha pubescens</i>	Other (OG)					0.1	3				
Lomandraceae	<i>Lomandra glauca</i>	Grass & grasslike (GG)	0.1	2	0.1	5	0.1	3			0.1	2
Lomandraceae	<i>Lomandra longifolia</i>	Grass & grasslike (GG)	0.1	2	0.1	5	10	20	0.1	2		
Myoporaceae	<i>Myoporum acuminatum</i>	Shrub (SG)	1	10								
Myrtaceae	<i>Angophora costata</i>	Tree (TG)					2	3				
Myrtaceae	<i>Corymbia gummifera</i>	Tree (TG)	5	2			2	2				
Myrtaceae	<i>Eucalyptus haemastoma</i>	Tree (TG)	1	0			9	1				
Myrtaceae	<i>Eucalyptus parramattensis</i>	Tree (TG)	0.5	0			1	2				
Myrtaceae	<i>Eucalyptus pilularis</i>	Tree (TG)	35	5			15	3				
Myrtaceae	<i>Eucalyptus robusta</i>	Tree (TG)										
Myrtaceae	<i>Euryomyrtus ramosissima</i>	Shrub (SG)	1	50	0.2	50	0.1	1				
Myrtaceae	<i>Gaudium laevigatum</i>	Exotic	5	20	1	60			1	10	5	200
Myrtaceae	<i>Leptospermum polygalifolium</i>	Shrub (SG)	1	20	10	20	1	4				
Myrtaceae	<i>Syzygium oleosum</i>	Shrub (SG)										
Olcaceae	<i>Olax stricta</i>	Shrub (SG)										

Family	Scientific Name	Plot ID	Q01		Q2		Q3		Q04		Q05	
		BAM Growth Form / High Threat Weeds	C	Ab	C	Ab	C	Ab	C	Ab	C	Ab
Phormiaceae	<i>Dianella caerulea</i>	Forb (FG)	2	50	0.1	20	5	20	0.1	5	0.1	50
Phormiaceae	<i>Dianella longifolia</i>	Forb (FG)										
Phyllanthaceae	<i>Breynia oblongifolia</i>	Shrub (SG)										
Phyllanthaceae	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Tree (TG)										
Pinaceae	<i>Pinus radiata</i>	Exotic			0.1	1						
Poaceae	<i>Eragrostis brownii</i>	Grass & grasslike (GG)							5	100	2	2000
Poaceae	<i>Eragrostis curvula</i>	HTW			0.1	20			70	20000	40	1000
Poaceae	<i>Melinis repens</i>	Exotic							2	2000	0.5	100
Poaceae	<i>thameda triandra</i>	Grass & grasslike (GG)									0.1	2
Proteaceae	<i>Banksia serrata</i>	Tree (TG)			0.1	1						
Proteaceae	<i>Conospermum ericifolium</i>	Shrub (SG)							0.1	1	1	100
Proteaceae	<i>Persoonia lanceolata</i>	Shrub (SG)	1	5	0.5	5					1	50
Proteaceae	<i>Persoonia levis</i>	Shrub (SG)	2	5								
Proteaceae	<i>Persoonia linearis</i>	Shrub (SG)										
Restionaceae	<i>Baloskion tetraphyllum</i>	Grass & grasslike (GG)										
Rubiaceae	<i>Pomax umbellata</i>	Forb (FG)	0.1	2	0.1	50	0.1	10	0.2	20	0.1	20
Solanaceae	<i>Solanum sisymbriifolium</i>	Exotic							0.1	5		
Thymelaeaceae	<i>Pimelea linifolia</i>	Shrub (SG)	1	50								
Verbenaceae	<i>Lantana camara</i>	HTW - Manageable										
Zamiaceae	<i>Macrozamia communis</i>	Other (OG)										

APPENDIX 3. FAUNA SPECIES LIST

Table 3A Fauna Species List

No.	Scientific Name	Common Name	Status		Observation Type*
			BC	EPBC	
1.	<i>Acrobates pygmaeus</i>	Feathertail Glider	P	-	Remote Camera
2.	<i>Amphibolurus muricatus</i>	Jacky Lizard	P	-	Pitfall Trap
3.	<i>Antechinus sp.</i>	Unidentified Antechinus	P	-	Elliot A, Remote Camera
4.	<i>Auromomus australis</i>	White-striped Freetail-bat	P	-	Anabat_13
5.	<i>Canis familiaris</i>	Dog	Feral	Feral	Remote Camera
6.	<i>Chalinolobus gouldii</i>	Gould's Wattled Bat	P	-	Anabat_13, Anabat_14, Anabat_15, Anabat_16
7.	<i>Crinia signifera</i>	Common Eastern Froglet	P	-	Spotlighting
8.	<i>Crinia tinnula</i>	Wallum Froglet	V,P	-	Spotlighting
9.	<i>Eopsaltria australis</i>	Eastern Yellow Robin	P	-	Remote Camera
10.	<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	V	-	Anabat_13
11.	<i>Hemiergis talbingoensis</i>	Eastern three-toed earless skink	P	-	Pitfall Trap
12.	<i>Lepus capensis</i>	Brown Hare	Feral	Feral	Remote Camera
13.	<i>Limnodynastes dumerillii</i>	Eastern Banjo Frog	P	-	Pitfall Trap
14.	<i>Limnodynastes peronii</i>	Brown-striped Frog	P	-	Pitfall Trap
15.	<i>Litoria peronii</i>	Peron's Tree Frog	P	-	Spotlighting
16.	<i>Litoria tyleri</i>	Tyler's Tree Frog	P	-	Spotlighting
17.	<i>Malurus cyaneus</i>	Superb Fairy-wren	P	-	Remote Camera
18.	<i>Micronomus norfolkensis</i>	Eastern Coastal Free-tailed Bat	V	-	Anabat_13(1)
19.	<i>Miniopterus australis</i>	Little Bent-winged Bat	V	-	Anabat_13(1), Anabat_14(1), Anabat_15(1), Anabat_16(1)
20.	<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V	-	Anabat_13(1), Anabat_14(1), Anabat_16(1)
21.	<i>Mus musculus</i>	House Mouse	Feral	Feral	Remote Camera
22.	<i>Myotis macropus</i>	Southern Myotis	V	-	Anabat_16
23.	<i>Nyctophilus sp.</i>	Long-eared bat	-	-	Anabat_13(1), Anabat_14(1), Anabat_15(1), Anabat_16(1)

No.	Scientific Name	Common Name	Status		Observation Type*
			BC	EPBC	
24.	<i>Oryctolagus cuniculus</i>	Rabbit	Feral	Feral	Remote Camera, Sighted
25.	<i>Ozimops ridei</i>	Eastern Free-tailed Bat	-	-	Anabat_14 Anabat_16
26.	<i>Petaurus breviceps</i>	Sugar Glider	P	-	Remote Camera
27.	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P	-	Remote Camera
28.	<i>Platyplectrum ornatum</i>	Ornate Burrowing Frog	P	-	Spotlighting
29.	<i>pseudocheirus peregrinus</i>	Common Ringtail Possum	P	-	Remote Camera
30.	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V,P	V	Spotlighting
31.	<i>Rattus fuscipes</i>	Bush Rat	P	-	Remote Camera
32.	<i>Rhipidura albiscapa</i>	Grey Fantail	P	-	Remote Camera
33.	<i>Sericornis frontalis</i>	White-browed Scrubwren	P	-	Remote Camera
34.	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	P	-	Remote Camera, Spotlighting
35.	<i>Uperoleia fusca</i>	Dusky Toadlet	P	-	Pitfall Trap
36.	<i>Uperoleia mahonyi</i>	Mahony's Toadlet	E,P	-	Pitfall Trap
37.	<i>Varanus varius</i>	Lace Monitor	P	-	Opportunistic
38.	<i>Vespadelus darlingtoni</i>	Large Forest Bat	-	-	Anabat_13 Anabat_14, Anabat_15, Anabat_16
39.	<i>Vespadelus pumilus</i>	Eastern Forest Bat	-	-	Anabat_13, Anabat_14, Anabat_15, Anabat_16
40.	<i>Vespadelus vulturnus</i>	Little Forest Bat	-	-	Anabat_13
41.	<i>Vulpes vulpes</i>	Fox	Feral	Feral	Remote Camera, Sighted

APPENDIX 4. PREDICTED AND CANDIDATE SPECIES REPORT

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00052110/BAAS24008/24/00052111	Modification 4 Western Extension Cabbage Tree Road Sand Quarry	09/04/2026
Assessor Name	Report Created	BAM Data version *
Mark Dean	13/04/2026	Current classification (live - default) (94)
Assessor Number	Assessment Type	BAM Case Status
BAAS24008	Major Projects	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
14		13/04/2026

* 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.

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common Name	Scientific Name	Vegetation Types(s)
Beach Stone-curlew	Esacus magnirostris	3544-Coastal Sands Apple-Blackbutt Forest
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	3544-Coastal Sands Apple-Blackbutt Forest
Black-necked Stork	Ephippiorhynchus asiaticus	3544-Coastal Sands Apple-Blackbutt Forest
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	3544-Coastal Sands Apple-Blackbutt Forest
Common Blossom-bat	Syconycteris australis	3544-Coastal Sands Apple-Blackbutt Forest
Diamond Firetail	Stagonopleura guttata	3544-Coastal Sands Apple-Blackbutt Forest
Dusky Woodswallow	Artamus cyanopterus cyanopterus	3544-Coastal Sands Apple-Blackbutt Forest
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	3544-Coastal Sands Apple-Blackbutt Forest

BAM Predicted Species Report

Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	3544-Coastal Sands Apple-Blackbutt Forest
Eastern Osprey	<i>Pandion cristatus</i>	3544-Coastal Sands Apple-Blackbutt Forest
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	3544-Coastal Sands Apple-Blackbutt Forest
Golden-tipped Bat	<i>Phoniscus papuensis</i>	3544-Coastal Sands Apple-Blackbutt Forest
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	3544-Coastal Sands Apple-Blackbutt Forest
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	3544-Coastal Sands Apple-Blackbutt Forest
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	3544-Coastal Sands Apple-Blackbutt Forest
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	3544-Coastal Sands Apple-Blackbutt Forest
Latham's Snipe	<i>Gallinago hardwickii</i>	3544-Coastal Sands Apple-Blackbutt Forest
Little Bent-winged Bat	<i>Miniopterus australis</i>	3544-Coastal Sands Apple-Blackbutt Forest
Little Eagle	<i>Hieraaetus morphnoides</i>	3544-Coastal Sands Apple-Blackbutt Forest
Little Lorikeet	<i>Parvipsitta pusilla</i>	3544-Coastal Sands Apple-Blackbutt Forest
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	3544-Coastal Sands Apple-Blackbutt Forest
Regent Honeyeater	<i>Anthochaera phrygia</i>	3544-Coastal Sands Apple-Blackbutt Forest
Scarlet Robin	<i>Petroica boodang</i>	3544-Coastal Sands Apple-Blackbutt Forest
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	3544-Coastal Sands Apple-Blackbutt Forest
Speckled Warbler	<i>Pyrrholaemus sagittatus</i>	3544-Coastal Sands Apple-Blackbutt Forest
Spotted Harrier	<i>Circus assimilis</i>	3544-Coastal Sands Apple-Blackbutt Forest
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	3544-Coastal Sands Apple-Blackbutt Forest
Square-tailed Kite	<i>Lophoictinia isura</i>	3544-Coastal Sands Apple-Blackbutt Forest
Superb Fruit-Dove	<i>Ptilinopus superbus</i>	3544-Coastal Sands Apple-Blackbutt Forest
Swift Parrot	<i>Lathamus discolor</i>	3544-Coastal Sands Apple-Blackbutt Forest
Turquoise Parrot	<i>Neophema pulchella</i>	3544-Coastal Sands Apple-Blackbutt Forest
Varied Sittella	<i>Daphoenositta chrysoptera</i>	3544-Coastal Sands Apple-Blackbutt Forest

BAM Predicted Species Report

White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	3544-Coastal Sands Apple-Blackbutt Forest
White-throated Needletail	<i>Hirundapus caudacutus</i>	3544-Coastal Sands Apple-Blackbutt Forest
Yellow-bellied Glider	<i>Petaurus australis</i>	3544-Coastal Sands Apple-Blackbutt Forest
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	3544-Coastal Sands Apple-Blackbutt Forest

Threatened species Manually Added

None added

Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
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BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00052110/BAAS24008/24/00052111	Modification 4 Western Extension Cabbage Tree Road Sand Quarry	09/04/2026
Assessor Name	Report Created	BAM Data version *
Mark Dean	13/04/2026	Current classification (live - default) (94)
Assessor Number	Assessment Type	BAM Case Status
BAAS24008	Major Projects	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
14		13/04/2026

* 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.

List of Species Requiring Survey

Name	Presence	Survey Months
<i>Allocasuarina simulans</i> Nabiac Casuarina	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Angophora inopina</i> Charmhaven Apple	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Asperula asthenes</i> Trailing Woodruff	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Burhinus grallarius</i> Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Callistemon linearifolius</i> Netted Bottle Brush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Cercartetus nanus</i> Eastern Pygmy-possum	No (surveyed)	☒ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Commersonia prostrata</i> Dwarf Kurrumbidgee	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Corybas dowlingii</i> Red Helmet Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☒ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Crinia tinnula</i> Wallum Froglet	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Cryptostylis hunteriana</i> Leafless Tongue Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Cynanchum elegans</i> White-flowered Wax Plant	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Diuris arenaria</i> Sand Doubletail	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☒ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Diuris praecox</i> Rough Doubletail	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☒ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Dromaius novaehollandiae</i> - endangered population Emu population in the New South Wales North Coast Bioregion and Port Stephens local government area	No (surveyed)	☒ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Esacus magnirostris</i> Beach Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Eucalyptus camfieldii</i> Camfield's Stringybark	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Eucalyptus parramattensis subsp. decadens</i> Eucalyptus parramattensis subsp. decadens	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Grevillea parviflora subsp. parviflora</i> Small-flower Grevillea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☒ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Lindernia alsinoides</i> Noah's False Chickweed	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Litoria aurea</i> Green and Golden Bell Frog	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Petauroides volans</i> Southern Greater Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☒ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Petaurus norfolcensis</i> Squirrel Glider	Yes (surveyed)	☒ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	No (surveyed)	☒ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Phascolarctos cinereus</i> Koala	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Planigale maculata</i> Common Planigale	No (surveyed)	☒ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Potorous tridactylus tridactylus</i> Northern long-nosed potoroo	No (surveyed)	☒ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Prostanthera densa</i> Villous Mint-bush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?

BAM Candidate Species Report

<i>Rhodomyrtus psidioides</i> Native Guava	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☒ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Syzygium paniculatum</i> Magenta Lilly Pilly	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☒ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Tetratheca juncea</i> Black-eyed Susan	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☒ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
<i>Uporeoleia mahonyi</i> Mahony's Toadlet	Yes (surveyed)	☒ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

Common Name	Scientific Name
Camfield's Stringybark	Eucalyptus camfieldii

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	Ninox connivens	Habitat constraints
Brush-tailed Rock-wallaby	Petrogale penicillata	Habitat constraints
Coast Groundsel	Senecio spathulatus	Habitat constraints
Eastern Cave Bat	Vespadelus troughtoni	Habitat constraints

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Eastern Osprey	<i>Pandion cristatus</i>	Habitat constraints
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Refer to BAR
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Habitat constraints
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	Habitat constraints
Little Bent-winged Bat	<i>Miniopterus australis</i>	Habitat constraints
Little Eagle	<i>Hieraaetus morphnoides</i>	Habitat constraints
Masked Owl	<i>Tyto novaehollandiae</i>	Habitat constraints
Powerful Owl	<i>Ninox strenua</i>	Habitat constraints
Regent Honeyeater	<i>Anthochaera phrygia</i>	Habitat constraints
Rufous Bettong	<i>Aepyprymnus rufescens</i>	Refer to BAR
South-eastern Glossy Black-Cockatoo	<i>Calyptorhynchus lathami lathami</i>	Refer to BAR
Southern Myotis	<i>Myotis macropus</i>	Habitat constraints
Square-tailed Kite	<i>Lophoictinia isura</i>	Habitat constraints
Stephens' Banded Snake	<i>Hoplocephalus stephensii</i>	Habitat constraints
Swift Parrot	<i>Lathamus discolor</i>	Habitat constraints
Tuncurry Midge Orchid	<i>Genoplesium littorale</i>	Refer to BAR
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	Habitat constraints

APPENDIX 5. BIODIVERSITY CREDIT REPORTS



BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00052110/BAAS24008/24/00052111	Modification 4 Western Extension Cabbage Tree Road Sand Quarry	09/04/2026
Assessor Name	Assessor Number	BAM Data version *
Mark Dean	BAAS24008	Current classification (live - default) (94)
Proponent Names	Report Created	BAM Case Status
Darren Williams	13/04/2026	Finalised
Assessment Revision	BOS entry trigger	Assessment Type
14		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.	
13/04/2026		

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		
Species		
Diuris arenaria / Sand Doubletail		



BAM Biodiversity Credit Report (Like for like)

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3544-Coastal Sands Apple-Blackbutt Forest	Not a TEC	2.9	0	36	36

3544-Coastal Sands Apple-Blackbutt Forest

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
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BAM Biodiversity Credit Report (Like for like)

	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_VZ1_Moderate	No	20	Karuah Manning, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_VZ2_Shrubby	No	11	Karuah Manning, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	3544_VZ3_Managed	No	5	Karuah Manning, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Crinia tinnula / Wallum Froglet	3544_VZ1_Moderate, 3544_VZ2_Shrubby, 3544_VZ3_Managed	0.3	5.00
Diuris arenaria / Sand Doubletail	3544_VZ1_Moderate, 3544_VZ2_Shrubby, 3544_VZ3_Managed	2.9	71.00
Eucalyptus parramattensis subsp. decadens / Eucalyptus parramattensis subsp. decadens	3544_VZ1_Moderate	11.0	22.00
Petaurus norfolcensis / Squirrel Glider	3544_VZ1_Moderate, 3544_VZ2_Shrubby	2.2	42.00
Phascolarctos cinereus / Koala	3544_VZ1_Moderate	0.7	27.00
Uperoleia mahonyi / Mahony's Toadlet	3544_VZ1_Moderate, 3544_VZ2_Shrubby, 3544_VZ3_Managed	2.9	48.00

Credit Retirement Options

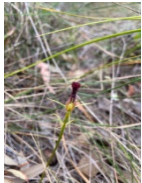
Like-for-like credit retirement options

Crinia tinnula / Wallum Froglet	Spp	IBRA subregion
	Crinia tinnula / Wallum Froglet	Any in NSW
Diuris arenaria / Sand Doubletail	Spp	IBRA subregion

BAM Biodiversity Credit Report (Like for like)

	Diuris arenaria / Sand Doubletail	Any in NSW
Eucalyptus parramattensis subsp. decadens / Eucalyptus parramattensis subsp. decadens	Spp	IBRA subregion
	Eucalyptus parramattensis subsp. decadens / Eucalyptus parramattensis subsp. decadens	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Uperoleia mahonyi / Mahony's Toadlet	Spp	IBRA subregion
	Uperoleia mahonyi / Mahony's Toadlet	Any in NSW

APPENDIX 6. TARGET ORCHID SURVEY COMMUNICATIONS

Species	Contact	Date	Reference Population/ Email Comms	Photo
<i>Diuris arenaria</i>	Port Stephens Council – Ashley Bacales	05/09/2024	Confirmation Email	
<i>Diuris praecox</i>	Samara Schulz	19/08/2021	Glenrock National Park	
	Daniel Allen at Central Coast Council	8/8/2023	Confirmation Email	
<i>Corybas dowlingii</i>	Environmental Planning Team (Ashley Bacales) at Port Stephens Council	6 June 2024	Stoney Ridge Reserve reference populations -	
	Paul Hillier DCCEEW	17 th June 2024	Grahamstown Dam	
<i>Cryptostylis hunteriana</i>	Samara Schulz	04/11/2021	Lake Munmorah -	
	David Martin	November 2024 & January 2025	Lake Munmorah	

Confirmation of *Diuris arenaria* found on-site by the National Herbarium:

From: [Andrew Orme](#)
To: [Ashley Owen](#)
Subject: RE: plant identification service - potential *Diuris arenaria* ~ BIS 22758
Date: Friday, 15 November 2024 7:31:41 PM
Attachments: [image001.png](#)
[image003.png](#)

Hello Ashley,

I apologise for the delay in responding.

Yes, I have confirmed your specimen as *Diuris arenaria* – conf. 14th Nov 2024.

It has been retained for the herbarium collection.

With kind regards,

Andrew

Andrew Orme
Identifications Senior Technical Officer
Botanical Identification Service
National Herbarium of New South Wales

Locked Bag 6002
Mount Annan NSW 2567
0410 025 101 | 02 4631 5136
andrew.orme@botanicgardens.nsw.gov.au
botanical.is@botanicgardens.nsw.gov.au
<https://www.botanicgardens.org.au/our-science/our-services/plant-identification-service>

We pay respect to all Elders and Traditional Custodians of the lands and waters that we nurture and care for.



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APPENDIX 7. SAIL ASSESSMENT

Introduction

The concept of Serious and Irreversible Impacts (SAIL) in the NSW Biodiversity Offset Scheme (BOS) aims to protect threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities.

The consent authority is to consider SAIL on biodiversity values that remain after the measures proposed to be taken to avoid or minimise the impact on biodiversity values of the proposed development or activity (s7.16 of the BC Act). The consent authority must refuse to grant consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) in the case of an application for development consent (other than for State significant development), if it is of the opinion that the proposed development is likely to have serious and irreversible impacts on biodiversity values.

There are four (4) key principles provided for in the BC Act (Section 6.5) and clause 6.7 of the BC Regulation that define the assessment of SAIL. These four (4) principles include the following:

- **Principle 1:** *Species or ecological community currently in a rapid rate of decline*
- **Principle 2:** *Species or ecological communities with a very small population size*
- **Principle 3:** *Species or area of ecological community with very limited geographic distribution*
- **Principle 4:** *Species or ecological community that is unlikely to respond to management and is therefore irreplaceable*

The document titled ‘*Guidance to assist a decision-maker to determine a serious and irreversible impact*’ (DPIE 2019) provides additional guidance and defines the criteria for listing biodiversity values at risk of a SAIL (Section 2.3), as outlined below:

“The Department has applied the criteria to all threatened species and threatened ecological communities listed under the BC Act. Entities that meet the criteria under one or more principle are identified as entities at risk of a SAIL in the Threatened Biodiversity Data Collection housed in BioNet and displayed on the Department website”.

Assessment Requirements

To assist the decision-maker to evaluate the extent and severity of the impact on an entity at risk of an SAIL, the BDAR or BCAR must contain details of the assessment of SAILS, in accordance with the criteria set out in Subsection 9.1.1 of the BAM for impacts on each TEC and in Subsection 9.1.2 for each threatened species. All criteria must be addressed for each TEC or threatened species at risk of an SAIL and likely to be impacted by the proposal. The assessment for each entity is provided in the following subsections.

Assessments for two (2) species at risk of SAIL have been completed for this proposal, including:

- *Diuris arenaria* (Sand Doubletail)
- Mahony’s Toadlet (*Uperoleia mahonyi*)

Diuris arenaria (Sand Doubletail)

Species Summary

Sand Doubletail is a small ground orchid, known from the Tomaree Peninsula near Newcastle, NSW (TBDC). Found in coastal heath and dry grassy eucalypt forest on sandy flats (TBDC). It is currently known from three main locations, two of which are reserved but occur in areas subject to disturbance (TBDC). Other scattered individuals are known to occur outside reserves (OEH, 2000). Light purple to mauve flowers appear through the months of August to September, and are 20-30 mm wide. Flowering stems can be up to 40 cm high. Usually there are two leaves, 15-50 cm long by 2-6 mm wide, growing from the base of the plant (TBDC).

Surveys completed

The species was recorded during targeted flora surveys undertaken within the Study Area. Additional surveys were conducted across the NS Project Area, however no other individuals were located.

Impact to species

One (1) individual was recorded within the Study Area. Following amendments to the proposed Impact Area no individuals occur within the Impact Area. A species polygon has been mapped within the Impact Area representing suitable habitat for the species, this includes areas of PCT 3544 with an intact native ground layer (Vegetation Zone 1, 2, and 3). Total area of species polygon: 2.88 ha. The proposed Impact Area has been amended following the identification of *Diuris arenaria*. The amended Impact Area results in no direct impacts to the species and reduces impacts to suitable habitat for the species within the Study Area.

Table 7-A: Impact Assessment for SAI species - *Diuris arenaria* (Sand Doubletail)

Criteria	Comments
1. Impact Avoidance	
What actions and measures were taken to avoid direct and indirect impacts on the species at risk of an SAI?	One (1) individual was recorded within the Study Area. Following amendments to the proposed Impact Area no individuals occur within the Impact Area. A species polygon has been mapped within the Impact Area representing suitable habitat for the species, this includes areas of PCT 3544 with an intact native ground layer (Vegetation Zone 1, 2, and 3). Total area of species polygon: 2.88 ha
Consistent with Criteria A within the Guidance Document (DPIE 2019): "The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAI".	The proposed Impact Area has been amended following the identification of <i>Diuris arenaria</i> . The amended Impact Area results in no direct impacts to the species and reduces impacts to suitable habitat for the species within the Study Area.
2. Current Population	

Criteria	Comments
Principle 1: species or ecological community currently in a rapid rate of decline. <i>Evidence of rapid decline</i> i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasite	Definitions: Rapid decline: In accordance with the Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019) a rapid decline is defined as when a "species has an observed, estimated, inferred, suspected or projected population reduction of ≥80% in 10 years or three generations (whichever is longer)". i. <i>decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or</i> As the species is listed as Endangered under the NSW BC Act, it is likely that the species was determined to meet the minimum requirements for eligibility for listing as an Endangered species (>50% reduction). Therefore, it is reasonable to conclude that the species' population has experienced a rapid rate of decline (>50% decline) in NSW over the past 10 years or three generations. • Endangered species - o "large" population reduction in accordance with Subclause 4.2(1b) in the NSW Biodiversity Conservation Regulation 2017. - o A population reduction of >50% (in accordance with the more stringent A2, A3 and A4 of IUCN (2001)) - o A population reduction of >70% (in accordance with the more stringent A2, A3 and A4 of IUCN (2001)) Conclusion The species meets Principle 1, the evidence available does confirm the species is experiencing a rapid decline.
Principle 2: species or ecological communities with a very small population size. <i>Evidence of small population size</i> i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations <i>Consistent with Criteria B within the Guidance Document (DPIE 2019): "The</i>	Definitions Very small population size: species within a known population size that is either: • Fewer than 50 mature individuals independent of whether there are any threats, or • Fewer than 250 mature individuals and the species has an observed, estimated or projected continuing decline: Of at least 25% in three years or one generation (whichever is longer) OR; Where the number of mature individuals in each subpopulation is <50 OR; The percentage of mature individuals in one subpopulation is 90-100% OR; The population is subject to extreme fluctuations in the number of individuals Population: means the total number of mature individuals in NSW. Mature individuals: include individuals known, estimated or inferred to be capable of reproduction. Subpopulations: geographically or otherwise distinct groups in the total population between which there is little demographic or genetic exchange i. New South Wales Population The Saving Our Species 2020-2021 annual report card for this species conducts monitoring of individuals at five locations: • Heatherbrae – accidental disturbance occurred, no data. • North Tomaree – population trend unknown • Shoal Bay – population trend unknown • South Tomaree – 273 individuals • Woromi – 4,255 total individuals (3,135 individuals at the primary monitoring site and 1,120 individuals at second monitoring site (this monitoring occurred after a prescribed burn in 2019 which saw an increase of 50%).)

Criteria	Comments
size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification".	i. Decline in NSW Population in three years Data is not available. i. Number of mature individuals in each subpopulation Data is not available
	Conclusion The species does not meet Principle 2 and is not characterized as having a very small population in accordance with <i>Guidance to assist a decision-maker to determine a serious and irreversible impact</i> (DPIE 2019).
Principle 3: species or area of ecological community with very limited geographic distribution Evidence of limited geographic range i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations Consistent with Criteria B within the Guidance Document (DPIE 2019): "The size of the local population directly and indirectly impacted by the	Definitions Very limited geographic distribution for a species: species have a very limited geographic distribution are generally known to: • Have an area of occupancy of <10 km² • Have an extent of occurrence of <100 km² • Have at least two of the following three conditions: - Are severely fragmented or only known from one location - Continuing decline - Extreme fluctuations • Inhabit less than or equal to three locations in New South Wales Severe fragmentation; occurs where there are increased extinction risks when most of the individuals of a species are found in relatively small and isolated populations. Decline can be observed, estimated, inferred or projected in any of the following: extent of occurrence; area of occupancy; area, extent and/or quality of habitat; number of locations or subpopulations; number of mature individuals. Fluctuations can be in any of the following: extent of occurrence; area of occupancy; number of locations or subpopulations; number of mature individuals. Location means a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat (IUCN 2017).

Criteria	Comments
development, clearing or biodiversity certification".	<i>i. Extent of Occurrence</i> The extent of occurrence (EOO) was estimated to be 21,426 km². The EOO is estimated based on a minimum convex polygon enclosing all mapped occurrences of the species, the method of assessment recommended by IUCN (2017). The species therefore meets the minimum EOO threshold of <100 km² to be considered as having a "Very limited geographic distribution". <i>ii. Area of Occupancy</i> The area of occupancy (AOO) was estimated to be 72 km². This calculation was based on the species occupying 18 (2 km x 2 km) grid cells, the spatial scale of assessment recommended by IUCN (2017). The species meets the minimum AOO threshold of <10km² to be considered as having a "Very limited geographic distribution". As the species meets the two (2) of the criteria above, and inhabits ≤ 3 locations, other factors were not assessed. <i>Other factors</i> In accordance with the Guidelines a species is considered to have a very limited geographic distribution if the species can meet at least two of the following three conditions: • Are severely fragmented or only known from one location – Not assessed • Continuing decline – Not assessed • Extreme fluctuations – Not assessed <i>iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences) - Not assessed</i> <i>iv. whether the species' population is likely to undergo extreme fluctuations</i> Not assessed. <i>Inhabit less than or equal to three locations in New South Wales</i> The species occurs at ≤ three locations, however other scatter individuals are known to occur. <i>Conclusion</i> The species meets Principle 3 as it is characterised as having a very limited geographic distribution in accordance with Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019). The species occurs within ≤ 3 locations and has an AOO < 10km² and EOO < 100 km²).
Principle 4 – species or ecological community that is unlikely to respond to management and is therefore irreplaceable	The consideration of whether an entity is unlikely to respond to management encompasses two key elements. 1. The Species – this is based on the best current ecological knowledge of the species including life history traits and characteristics of the species. Some species display particular life history traits that severely limit the species' ability to increase in abundance, these are species with: • Life history traits and/or ecology which is known, but the ability to control key threats at the site scale is negligible. In general, these are species significantly

Criteria	Comments
<i>Evidence that the species is unlikely to respond to management</i> i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site. ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	threatened by uncontrollable disease (e.g. frogs are highly threatened by chytrid fungus) • Known reproductive characteristics that severely limit their ability to increase the existing population on, or occupy new habitat at, a stewardship site. In general, these are plants that are sterile or largely clonal with no or very limited capacity to increase in number through seed production and recruitment. 2. Irreplaceable - Whether an impact on an entity is considered irreplaceable takes into account two factors. The first factor is the likely success in achieving gain in condition, abundance or habitat area. For potential species that are identified in criteria 1 and 2 above, the likelihood of achieving an offset gain is extremely low or highly uncertain. The second factor takes into account consideration of impacts on habitat components that cannot readily be re-created. In general, these are impacts on essential habitat such as caves or cliff lines that are used by threatened species.
	<i>i. known reproductive characteristics severely limit the ability to increase the existing population on or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site.</i> Not applicable <i>ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site</i> Not applicable <i>iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).</i> No, the key threatening process is clearing, and this can be controlled on a BSS
	<i>Conclusion</i> The species does not meet Principle 4 as the species does not meet the minimum requirements of a species that is unlikely to respond to management.
Is the species at risk of Serious and Irreversible Impacts?	The species is at risk of Serious and Irreversible Impacts (SAIL) – the species meets Principle 1 & 3, as such it is considered a species at risk of SAIL.
3. Impacts of the proposal on the SAIL species	

Criteria	Comments											
Impact on the species' population i) Estimate of the number of individuals present in the subpopulation on the subject land and as a percentage of the total NSW population 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, Consistent with Criteria B within the Guidance Document (DPIE 2019): “The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification” in Guidance Document (DPIE 2019). 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. Consistent with Criteria D in the Guidance Document (DPIE 2019). Consistent with Criteria E in the Guidance Document (DPIE 2019).	One (1) individual was recorded within the Study Area. Following amendments to the proposed Impact Area no individuals occur within the Impact Area. A species polygon has been mapped within the Impact Area representing suitable habitat for the species, this includes areas of PCT 3544 with an intact native ground layer (Vegetation Zone 1, 2, and 3). Total area of species polygon: 2.88 ha The proposed Impact Area has been amended following the identification of <i>Diuris arenaria</i>. The amended Impact Area results in no direct impacts to the species and reduces impacts to suitable habitat for the species within the Study Area.											
Impact on geographic range 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 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	i. area of species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW The proposal will result in impacts to 2.88 ha of habitat for the species. Area of Occupancy (AOO) and Extent of Occurrence (EOO) have been calculated for the species in NSW in accordance with the <i>IUCN Guidelines for Using the IUCN Red List Categories and Criteria</i> (2022) as detailed above. The results are as follows: Total Extent of Occurrence (EOO) = 21,426 km2 Total Area of Occupancy (AOO) = 72 km2 The impact of the proposed development on the species as a percentage of EOO and AOO are detailed below. <table><tr><th>Measure</th><th>Impact</th><th>NSW AOO / percentage impact (%)</th><th>NSW EOO / percentage impact (%)</th></tr><tr><td>Habitat Area (ha)</td><td>2.88 ha</td><td>72 km2 (<0.05%)</td><td>21,426 km2 (<0.001%)</td></tr></table>				Measure	Impact	NSW AOO / percentage impact (%)	NSW EOO / percentage impact (%)	Habitat Area (ha)	2.88 ha	72 km2 (<0.05%)	21,426 km2 (<0.001%)
Measure	Impact	NSW AOO / percentage impact (%)	NSW EOO / percentage impact (%)									
Habitat Area (ha)	2.88 ha	72 km2 (<0.05%)	21,426 km2 (<0.001%)									

Criteria	Comments
the species will be directly impacted. ii) 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 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. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR. Consistent with Criteria F in the Guidance Document (DPIE 2019). Consistent with Criteria G in the Guidance Document (DPIE 2019). Consistent with Criteria H in the Guidance Document (DPIE 2019).	ii. Impact on 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 proposed development will directly impact a total of one individual of the species and a total of 2.88 ha of suitable habitat for the species. However, the surrounding area also provides suitable habitat including within the on-site offset area, which covers approximately 131.47 ha, and includes 39 ha of suitable habitat for the species.
	ii. Fragmentation of Subpopulation The proposed development will impact a total of 2.88 ha of suitable habitat for the species amongst a much larger area of habitat including the on-site offset area (131.47 ha) and the connected Tilligerry State Conservation Area. Considering the above the proposal is not anticipated to lead to the fragmentation of a subpopulation of the species.
Criteria I in the Guidance Document (DPIE 2019); <i>An estimate of the area, or number of populations and</i>	The most recent accessible data from OEH SoS team is from the 2020-2021 annual report card for the species which provides numbers of individuals in the following two locations located within reserves: • South Tomaree – 273 individuals

Criteria	Comments
<i>size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion.</i>	Woromi – 4,255 total individuals Data was not available for other locations.
4. New Information	
<i>The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAIL, is inaccurate.</i>	Not Applicable

Conclusion

The proposal will result in direct impact to one individual *Diuris arenaria* and 2.88 ha of suitable habitat for the species. The proposed Impact Area has been amended following the identification of *Diuris arenaria*. The amended Impact Area results in no direct impacts to the species and reduces impacts to suitable habitat for the species within the Study Area.

As such, the proposed modification is unlikely to result in a significant impact to this SAIL species.

Mahony's Toadlet (*Uperoleia mahonyi*)

Species Summary

Mahony's Toadlet is known to inhabit 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, also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Distribution limit: N-Seal Rocks S-Kangy Angy (to date)

Surveys completed

Surveys were completed in accordance with the NSW Survey Guide for Threatened Frogs including spotlighting surveys on 08/05/2024, 09/05/2024, 16/02/2026 and 18/02/2026, with additional surveys being completed as part of the Newcastle Sands Quarry annual monitoring on 26/03/2020, 11/11/2020, 08/11/2021, 2/02/2022, 31/01/2023, 20/02/2024, 9/01/2025, 19/01/2026 and 16/01/2026. Surveys were completed via random meanders across the Study Area within suitable habitat using high-powered headtorches to search for all types of nocturnal fauna

Impact to species

The species was recorded at six (6) separate locations within the Study Area including in pitfall traps. In accordance with the NSW Survey Guide for Threatened Frogs "the species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 400 metres radius from the top of bank of the breeding site". As such all suitable areas of aquatic habitat within the Subject Land were mapped and a 400 buffer was established from the top of bank. As PCT 3544 is associated with the species areas of this PCT within the 400 m buffer were incorporated into a species polygon for the species.

The total area of suitable habitat being impacted by the proposed modification is 2.88 ha.

Table 7-B: Impact Assessment for SAIL species - Mahony's Toadlet (*Uperoleia mahonyi*)

Criteria	Comments
1. Impact Avoidance	
What actions and measures were taken to avoid direct and indirect impacts on the species at risk of an SAIL? Consistent with Criteria A within the Guidance Document (DPIE 2019): "The action and measures taken to avoid the direct and indirect impact on the potential entity for a SAIL".	The species was recorded at six (6) separate locations within the Study Area including in pitfall traps. In accordance with guidelines all suitable areas of aquatic habitat within the Subject Land were mapped and a 400 buffer was established from the top of bank. As PCT 3544 is associated with the species areas of this PCT within the 400 m buffer were incorporated into a species polygon for the species. The total area of suitable habitat being impacted by the proposed modification is 2.88 ha. Avoid Direct Impacts The proposed Impact Area avoids direct impacts to suitable aquatic habitat for the species. Avoid Indirect Impacts The proposed Impact Area has been further reduced to avoid areas within the 400 m suitable habitat buffer for the species. The current proposal will impact a total of 2.88 ha of suitable habitat, a reduction from the original proposed impacts of 4.67 ha. The proposal is not expected to result in impacts to water quality, waterbodies, or hydrological processes that would adversely affect the aquatic habitat of the species. Resulting Avoidance

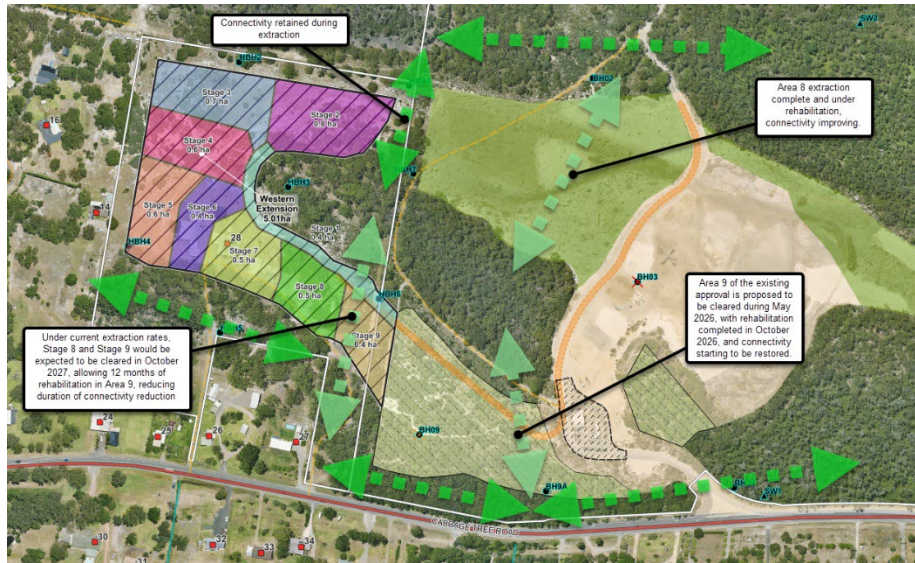
Criteria	Comments
	The proposal will impact a total of 2.88 ha of suitable habitat for the species (within 400 m of aquatic habitat). This represents 36 % of suitable habitat within the Study Area.
2. Current Population	
Principle 1: species or ecological community currently in a rapid rate of decline. <i>Evidence of rapid decline</i> <i>i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or</i> <i>ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasite</i>	Definitions: Rapid decline: In accordance with the Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019) a rapid decline is defined as when a "species has an observed, estimated, inferred, suspected or projected population reduction of ≥80% in 10 years or three generations (whichever is longer)". <i>i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or</i> The recent discovery of <i>Uperoleia mahonyi</i> prevents any quantification of decline in this species. However, it is assumed that habitat loss and other threats would have negatively impacted <i>U. mahonyi</i> over the last 150 years, given the history of urban and agricultural development as well as habitat disturbance of coastal areas within the species known distribution. Conclusion Data deficient: the evidence available is unable to confirm whether the species is experiencing a rapid decline.
Principle 2: species or ecological communities with a very small population size. <i>Evidence of small population size</i> <i>i. an estimate of the species' current population size in NSW, and</i>	Definitions Very small population size: species within a known population size that is either: - Fewer than 50 mature individuals independent of whether there are any threats, or - Fewer than 250 mature individuals and the species has an observed, estimated or projected continuing decline: Of at least 25% in three years or one generation (whichever is longer) OR; Where the number of mature individuals in each subpopulation is <50 OR; The percentage of mature individuals in one subpopulation is 90-100% OR; The population is subject to extreme fluctuations in the number of individuals

Criteria	Comments
ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations Consistent with Criteria B within the Guidance Document (DPIE 2019): "The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification".	Population: means the total number of mature individuals in NSW. Mature individuals: include individuals known, estimated or inferred to be capable of reproduction. Subpopulations: geographically or otherwise distinct groups in the total population between which there is little demographic or genetic exchange
	ii. <i>New South Wales Population</i> There are currently no population estimates for the species, however, at water bodies where they are recorded the estimated abundance is in the hundreds. ii. <i>Decline in NSW Population in three years</i> Data is not available. ii. <i>Number of mature individuals in each subpopulation</i> Data is not available
	Conclusion Data Deficient – however the species is unlikely to meet Principle 2 and is not characterized as having a very small population in accordance with <i>Guidance to assist a decision-maker to determine a serious and irreversible impact'</i> (DPIE 2019).
Principle 3: species or area of ecological community with very limited geographic distribution Evidence of limited geographic range i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations Consistent with Criteria B within the Guidance Document (DPIE 2019): "The size of the local population directly and indirectly impacted by the	<i>Definitions</i> Very limited geographic distribution for a species: species have a very limited geographic distribution are generally known to: • Have an area of occupancy of <10 km² • Have an extent of occurrence of <100 km² • Have at least two of the following three conditions: - Are severely fragmented or only known from one location - Continuing decline - Extreme fluctuations • Inhabit less than or equal to three locations in New South Wales Severe fragmentation; occurs where there are increased extinction risks when most of the individuals of a species are found in relatively small and isolated populations. Decline can be observed, estimated, inferred or projected in any of the following: extent of occurrence; area of occupancy; area, extent and/or quality of habitat; number of locations or subpopulations; number of mature individuals. Fluctuations can be in any of the following: extent of occurrence; area of occupancy; number of locations or subpopulations; number of mature individuals. Location means a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat (IUCN 2017).

Criteria	Comments
development, clearing or biodiversity certification".	<i>i. Extent of Occurrence</i> The distribution of <i>Uperoleia mahonyi</i> is highly restricted. The extent of occurrence (EOO) is estimated to be 1,905 km² based on a minimum convex polygon enclosing all mapped occurrences of the species in NSW (Clulow et al. 2016), the method of assessment recommended by IUCN (2019). The NSW Scientific Committee (2017) note that "Due to the recent discovery of this species, both the AOO and EOO may increase with further targeted surveys.". However, the potential for some future increase in the known distribution, it is not expected that the geographic range will increase dramatically and so exceed the threshold for Endangered, as <i>U. mahonyi</i> is a habitat specialist and the required habitat is limited. Therefore, the species does not meet the minimum EOO threshold of <100 km² to be considered as having a "Very limited geographic distribution".
	<i>ii. Area of Occupancy</i> The area of occupancy (AOO) is estimated to be 36 km² based on nine 2 x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2019). Therefore, the species does not meet the minimum AOO threshold of <10km² to be considered as having a "Very limited geographic distribution". As the species does not meet the two (2) of the criteria above, and inhabits > 3 locations, other factors were also considered.
	<i>Other factors</i> In accordance with the Guidelines a species is considered to have a very limited geographic distribution if the species can meet at least two of the following three conditions: • Are severely fragmented or only known from one location • Continuing decline • Extreme fluctuations <i>Uperoleia mahonyi</i> is considered to be severely fragmented. Most known populations are separated by distances greater 10 km, further than the species is likely to disperse, in addition to being separated by physical barriers to dispersal such as roads, industrial areas, and heavily modified landscapes including golf courses and pasture. These kinds of barriers have been shown to considerably impair or prevent amphibian dispersal (Cushman 2006). In a review of the effects of habitat fragmentation on amphibians, Cushman (2006) highlighted that habitat connectivity was a key element of population persistence for amphibians which as a group are sensitive to disturbances and prone to frequent local extinctions and turnover (Edenham 1996; Hecnar and M'Closkey 1996; Alford and Richards 1999; Trenham et al., 2003) requiring recolonization from adjacent habitat and populations to persist. On this basis and taking a precautionary approach to assessing this species, none of the populations can be considered viable in the absence of regular dispersal events between populations. It is likely that the impacts of habitat fragmentation and the numerous barriers to dispersal have eliminated or severely reduced population and habitat connectivity for the known populations and that the numerous threats (detailed below) in addition to the tendency for amphibians to experience stochastic local extinctions. As such, the species is considered to be severely fragmented and meets this other factor.
	<i>iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences) - Not assessed</i> <i>iv. whether the species' population is likely to undergo extreme fluctuations</i>

Criteria	Comments
	Not assessed. <i>Inhabit less than or equal to three locations in New South Wales</i> The species occurs at ≤ three locations, however other scatter individuals are known to occur. <i>Conclusion</i> The species meets part of Principle 3 as it is characterised as being severely fragmented in accordance with Guidance to assist a decision-maker to determine a serious and irreversible impact' (DPIE 2019).
Principle 4 – species or ecological community that is unlikely to respond to management and is therefore irreplaceable <i>Evidence that the species is unlikely to respond to management</i> i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site. ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	The consideration of whether an entity is unlikely to respond to management encompasses two key elements. 3. The Species – this is based on the best current ecological knowledge of the species including life history traits and characteristics of the species. Some species display particular life history traits that severely limit the species' ability to increase in abundance, these are species with: • Life history traits and/or ecology which is known, but the ability to control key threats at the site scale is negligible. In general, these are species significantly threatened by uncontrollable disease (e.g. frogs are highly threatened by chytrid fungus) • Known reproductive characteristics that severely limit their ability to increase the existing population on, or occupy new habitat at, a stewardship site. In general, these are plants that are sterile or largely clonal with no or very limited capacity to increase in number through seed production and recruitment. 4. Irreplaceable - Whether an impact on an entity is considered irreplaceable takes into account two factors. The first factor is the likely success in achieving gain in condition, abundance or habitat area. For potential species that are identified in criteria 1 and 2 above, the likelihood of achieving an offset gain is extremely low or highly uncertain. The second factor takes into account consideration of impacts on habitat components that cannot readily be re-created. In general, these are impacts on essential habitat such as caves or cliff lines that are used by threatened species. <i>i. known reproductive characteristics severely limit the ability to increase the existing population on or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site.</i> Not applicable <i>ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site</i> Not applicable <i>iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).</i> No, the key threatening process is clearing, and this can be controlled on a BSS

Criteria	Comments
	<i>Conclusion</i> The species does not meet Principle 4 as the species does not meet the minimum requirements of a species that is unlikely to respond to management.
Is the species at risk of Serious and Irreversible Impacts?	The species is potentially at risk of Serious and Irreversible Impacts (SAIL) – the species meets part of Principle 3, as such it is assessed as a species at risk of SAIL.
3. Impacts of the proposal on the SAIL species	
Impact on the species' population i) Estimate of the number of individuals present in the subpopulation on the subject land and as a percentage of the total NSW population 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, Consistent with Criteria B within the Guidance Document (DPIE 2019): "<i>The size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification</i>" in Guidance Document (DPIE 2019). 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. Consistent with Criteria D in the Guidance Document (DPIE 2019). Consistent with Criteria E in the Guidance Document (DPIE 2019).	Subject Land The species was recorded at six (6) separate locations within the Study Area including in pitfall traps. In accordance with the NSW Survey Guide for Threatened Frogs "the species polygon boundary should align with aquatic habitats linked directly to the record and a buffer, incorporating the PCTs with which the species is associated, of 400 metres radius from the top of bank of the breeding site". As such all suitable areas of aquatic habitat within the Subject Land were mapped and a 400 buffer was established from the top of bank. As PCT 3544 is associated with the species areas of this PCT within the 400 m buffer were incorporated into a species polygon for the species. The total area of suitable habitat being impacted by the proposed modification is 2.88 ha.
Impact on geographic range i) the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage	i. area of species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW The proposal will result in impacts to 2.88ha of habitat for the species Area of Occupancy (AOO) and Extent of Occurrence (EOO) have been calculated for the species in NSW in accordance with the <i>IUCN Guidelines for Using the IUCN Red List Categories and Criteria</i> (2022) as detailed above. The results are as follows:

Criteria	Comments								
of the total AOO, or EOO within NSW 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. ii) 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 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. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	• Total Extent of Occurrence (EOO) = 1,925 km2 • Total Area of Occupancy (AOO) = 38 km2 The impact of the proposed development on the species as a percentage of EOO and AOO are detailed below. <table><tr><th>Measure</th><th>Impact</th><th>NSW AOO / percentage impact (%)</th><th>NSW EOO / percentage impact (%)</th></tr><tr><td>Habitat Area (ha)</td><td>2.88 ha</td><td>38 km2 (0.076%)</td><td>1,925 km2 (<0.001%)</td></tr></table> ii. <i>Impact on 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.</i> The proposed development will directly impact a total of 2.88ha of suitable habitat for the species. However, no core habitat for the species will be impacted and the surrounding area also provides suitable habitat including within the on-site offset area, which covers approximately 131.47 ha, and includes a large area of core habitat for the species. ii. <i>Fragmentation of Subpopulation</i> The proposed development will impact a total of 2.88ha of suitable habitat for the species amongst a much larger area of habitat including the on-site offset area (131.47 ha) and the connected Tilligerry State Conservation Area. Impacts to habitat connectivity for the species have been further reduced through the removal of the northern access route between the existing sand mine and the Western Extension. Impacts to connectivity to the south have been minimised by staging impacts and rehabilitation along this corridor. Considering the above the proposal is not anticipated to lead to the fragmentation of a subpopulation of the species. 	Measure	Impact	NSW AOO / percentage impact (%)	NSW EOO / percentage impact (%)	Habitat Area (ha)	2.88 ha	38 km2 (0.076%)	1,925 km2 (<0.001%)
Measure	Impact	NSW AOO / percentage impact (%)	NSW EOO / percentage impact (%)						
Habitat Area (ha)	2.88 ha	38 km2 (0.076%)	1,925 km2 (<0.001%)						

Consistent with **Criteria F** in the Guidance Document (DPIE 2019).

Criteria	Comments
Consistent with Criteria G in the Guidance Document (DPIE 2019). Consistent with Criteria H in the Guidance Document (DPIE 2019).	
Criteria I in the Guidance Document (DPIE 2019); <i>An estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion.</i>	The recent discovery and lack of population data for <i>Uperoleia mahonyi</i> prevents the quantification of any reductions, however, given the species occurs in areas that have faced increasing pressure from urbanisation and agriculture it is considered highly likely that a population reduction has occurred.
4. New Information	
<i>The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAI, is inaccurate.</i>	Not Applicable

Conclusion

The proposed development will directly impact a total of 2.88ha of suitable habitat for the species. However, no core habitat for the species will be impacted and the surrounding area also provides suitable habitat including within the on-site offset area, which covers approximately 131.47 ha, and includes a large area of core habitat for the species.

Impacts to habitat connectivity for the species have been further reduced through the removal of the northern access route between the existing sand mine and the Western Extension. Impacts to connectivity to the south have been minimised by staging impacts and rehabilitation along this corridor.

As such, it is unlikely that the proposed modification will result in a significant impact to the potential SAI entity.

APPENDIX 8. EPBC ASSESSMENTS OF SIGNIFICANCE

Species Assessed under the EPBC Act Significant Impact Guidelines

The following pertains to Assessments of Significance for direct or indirect impacts to EPBC Act listed threatened species, populations and communities.

The following species have been assessed under the EPBC Act *Matters of National Environmental Significance*

Significant impact guidelines 1.1 (Department of the Environment [DotE], 2013) (Significant Impact Guidelines):

Critically Endangered Species

- Swift Parrot (*Lathamus discolor*)

Endangered Species

- Koala (*Phascolarctos cinereus*)
- Mahony's Toadlet (*Uperolia mahonyi*)

Vulnerable Species

- *Eucalyptus parramattensis subsp. decadens* (Earps Gum)
- New Holland Mouse (*Pseudomys novaehollandiae*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Large-eared Pied Bat (*Chalinolobus dwyeri*)

Migratory Species

None

Critically Endangered and Endangered Species – EPBC Act Assessment of Significance

The EPBC Act Significant Impact Guidelines (DOE 2013) state:

- An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
 - lead to a long-term decrease in the size of a population
 - reduce the area of occupancy of the species
 - fragment an existing population into two or more populations
 - adversely affect habitat critical to the survival of a species
 - 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
 - result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
 - introduce disease that may cause the species to decline, or
 - interfere with the recovery of the species.
- A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:
 - a geographically distinct regional population, or collection of local populations, or
 - a population, or collection of local populations, that occurs within a particular bioregion.
- An 'invasive species' is an introduced species, including an introduced (translocated) native species, which out-competes native species for space and resources or which is a predator of native species. Introducing an invasive species into an area may result in that species becoming established. An invasive species may harm listed threatened species or ecological communities by direct competition, modification of habitat or predation.
 - 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:
 - for activities such as foraging, breeding, roosting, or dispersal
 - for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
 - to maintain genetic diversity and long term evolutionary development, or
 - for the reintroduction of populations or recovery of the species or ecological community.
- Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

Table A6 1: Significant impact criteria assessment – Swift Parrot (*Lathamus discolor*)

Species assessed	Swift Parrot (<i>Lathamus discolor</i>)
Criteria	Discussions
Lead to a long-term decrease in the size of a population	The Development Site is not located within mapped important area for the Swift Parrot. However, there are some foraging opportunities for this species including winter flowering species such as <i>E. haemastoma</i> . The Development Site is bordered by the proposed On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. Therefore, due to the large amount of available habitat within the locality, the proposed works are not considered to lead to a long-term decrease in the size of the Swift Parrot population.
Reduce the area of occupancy for of the species	A small area of suitable habitat will be removed (0.74 ha), this area has some connectivity to the larger tracts of vegetation within the proposed On-Site Offset and within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. The proposed works will remove approximately 0.74ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing population into two or more populations	The Swift Parrot is a highly mobile species. As such, it is not considered that the proposed works will fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species	No critical habitat such as breeding habitat for the Swift Parrot is within the Development Site. As such, it is not considered that the proposed works will adversely affect habitat critical to the survival of this species.
Disrupt the breeding cycle of a population	The Swift Parrot does not breed within NSW. As such, it is not considered that the proposed works will disrupt the breeding cycle of this species' populations.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The proposed works will remove potential foraging habitat for this species. The removal of some of the foraging habitat within the Development Site is part of a larger area of habitat within the Hunter and Karuah Manning subregions. As no breeding habitat is to be impacted on, it is not considered that the proposed works will modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critical endangered species becoming established in the critically endangered species' habitat	Feral cats are identified as a pest animal for this species. There is potential for feral cats to be attracted to the area as a result of waste created during construction and not being disposed of correctly. Proposed mitigation measures, if implemented correctly should reduce the risk of any feral cats being attracted to the area.
Introduce disease that may cause the species to decline	<i>Psittacine cirovirus</i> is identified as a disease that causes beak and feather vulnerability. This disease occurs naturally in the wild. It is not considered the actions from the construction and operation of the project will introduce disease that may cause the species to decline.

Table A6 1: Significant impact criteria assessment – Swift Parrot (*Lathamus discolor*)

Interfere substantially with the recovery of the species	Habitat loss and industrial development are listed in the National Recovery Plan as actions that pose a significant threat to habitat. The project will directly impact 2.82 ha of potential foraging habitat. There is approximately 515.78 ha of suitable habitat for the Swift Parrot within a 5 km radius of the Development Site. The proposed Development Modification will clear 0.74 ha, approximately 0.1% of available habitat. The Swift Parrot is a highly mobile species, and due to the amount of available foraging habitat within the area, it is considered the impacts from the project will not interfere substantially with the recovery of this species.
Conclusion	The proposed works are unlikely to result in a significant impact to these species as: - no key habitat will be directly impacted on; and - the proposed action will not disrupt the breeding cycle of the species.

Table A6 2 Significant impact criteria assessment – Koala (*Phascolarctos cinereus*)

Species assessed	Koala (<i>Phascolarctos cinereus</i>)
Criteria	Discussion
Lead to a long-term decrease in the size of a population	The proposed works will remove approximately 0.74 ha of suitable habitat for this species. The habitat in the Development Site has connectivity to the larger tracts of vegetation within the On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. As such, any impacts to this species habitat are not considered to lead to a long-term decrease in the size to its population.
Reduce the area of occupancy for of the species	A small area of suitable habitat will be removed, this area has connectivity to the larger tracts of vegetation within the approved On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. The proposed works will remove approximately 0.74 ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing population into two or more populations	The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the approved On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. Within the locality, the proposal will not impact on connectivity, as there is no movement corridor through The Project Area north-south, as there is no connected vegetation on the southern site of Cabbage Tree Road. The Proposed Modification has the potential to increase fragmentation of habitat on a local scale, within The Project Area. However, as the proposed Development Site will be progressively rehabilitated post extraction, impacts on local connectivity will be temporary. As such, impacts on connectivity are unlikely to being significant.
Adversely affect habitat critical to the survival of a species	The habitat within the Development Site was identified as Supplementary under the Port Stephens CKPoM. There are areas of more suitable habitat (Preferred Habitat under the CKPoM) which occur within the On-Site Offset. As only a small area of Supplementary habitat will be removed due to the proposal, it is unlikely that the proposed works will adversely affect habitat critical to the survival of this species.

Table A6 1: Significant impact criteria assessment – Swift Parrot (*Lathamus discolor*)

Disrupt the breeding cycle of a population	Access within the grounds of the Newcastle Sand quarry is restricted, as such the level of disturbance would return to its current level on completion of the construction works. As the Development Site has connectivity to larger areas of habitat within the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown, it is considered that the proposed works will not disrupt the breeding cycle of this species population.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The proposed works will remove approximately 0.74 ha of suitable habitat for this species. The habitat to be removed within the Development Site has some connectivity to larger areas of habitat within On-Site Offset and Tilligerry SCA and adjacent areas around Tomago and Williamtown. Additionally, the Development Site will be progressively rehabilitated post extraction. As such, it is considered that the proposed works will not modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	The clearing of vegetation within the Development Site may increase the movement of invasive predatory species into new habitat that may be occupied by this species. Red fox (<i>Vulpes Vulpes</i>) has been identified as a threat from invasive species for this species. To avoid, minimise and/or manage impact identified in Section 5.3 predator control program to control feral animals is to be put in place for the proposed works.
Introduce disease that may cause the species to decline	Koala retrovirus (KoRV) and Chlamydia (<i>Chlamydia percorum</i>) are identified diseases in the Conservation Advice for the Koala (DAWE 2022c). Wild populations carry disease pathogens. Inadvertent spread of disease also occurred historically following koala translocations. The proposed works will not introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species	Habitat loss and degradation, vehicle strikes, and dog attacks are listed in the Conservation Advice as threats to the Koala. The proposed works will involve clearing 0.74 ha of potential habitat for the Koala. The proposed Development Site is an extension of an existing quarry, therefore a number of vehicles and machinery already traverse the site. When there is human activity there is a chance wild and/or domestic dogs will be attracted to the site searching for food. To mitigate the impacts of clearing native vegetation and reduce potential fragmentation. Measures such as reducing the width of cleared areas will reduce the impacts of habitat loss. Ensuring quarry vehicles and machinery drive at reduced speeds ensure drivers have the time to stop and avoid potential strikes of koala when driving onsite. Pre-clearing surveys, focusing on identifying and avoiding any occupied trees will be conducted prior to the commencement of any clearing works. To reduce the potential for wild and/or domestic dogs being attracted to the site, all waste will be disposed of correctly and rubbish bin will have secured and have appropriately fitted lids avoiding them being pushed over and spilling contents. With connectivity to larger areas of habitat, vehicle speed limits and ensuring waste is disposed of correctly and securely, it is considered the project will not Interfere substantially with the recovery of the species.
Conclusion	The proposed works are unlikely to result in a significant impact to this species as: - the works will not have a significant impact on the size, area, populations or increase isolation of this species; and - no critical habitat will be directly impacted on.

Table A6 3: Significant impact criteria assessment – Endangered Frogs

Species assessed	Mahony's Toadlet (<i>Uperoleia mahonyi</i>)
Criteria	Discussions
Lead to a long-term decrease in the size of a population	The species was identified during field surveys (pit fall trapping) and is known from the surrounding Swamp Habitat (within the On-site Offset). High quality habitat for the species includes wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Aquatic vegetation at breeding sites includes sedges (<i>Schoenoplectus</i> spp., <i>Baumea</i> spp. and <i>Lepironia articulata</i>) and Broadleaf Cumbungi (<i>Typha orientalis</i>). Breeding habitat for Mahony's Toadlet includes permanent or semi-permanent swamps and ponds of moderate size with no apparent flow of water (TSSC 2020). Areas of this higher quality breeding habitat for the species is located within proximity to the Development Site, however it is outside of the area to be cleared within the On-Site Offset. Vegetation to be cleared within the Development Site comprises of Smooth-barked Apple-Blackbutt-Old Man Banksia woodland and is considered to be marginal, or supplementary habitat for Mahony's Toadlet. The proposed works will remove approximately 2.88 ha of supplementary habitat for this species. The habitat in the Development Site is connect to the larger tracts of vegetation within the approved On-Site Offset and Tilligerry SCA. As such, impacts to this species are not considered to lead to a long-term decrease in the size to its population.
Reduce the area of occupancy for of the species	A small area of suitable habitat will be removed, this area has some connectivity to the larger tracts of vegetation within the approved On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. The proposed works will remove approximately 2.88 ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing population into two or more populations	The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the approved On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. Within the locality, the proposal will not impact on connectivity, as there is no movement corridor through The Project Area north-south, as there is no connected vegetation on the southern side of Cabbage Tree Road. The Proposed Modification has the potential to increase fragmentation of habitat on a local scale, within The Project Area. The habitat occurring within the centre on the eastern border of the western extension, will be cut off from other vegetation temporarily. However, as the proposed Development Site will be progressively rehabilitated post extraction, impacts on local connectivity will be temporary. As such, impacts on connectivity are unlikely to being significant.
Adversely affect habitat critical to the survival of a species	As the proposed Development Site does not contain any swamp vegetation or swales suitable for breeding, it is unlikely that it contains habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	The Development Site is not located within breeding habitat for Mahony's Toadlet. As such, it is not considered that the proposed works will disrupt the breeding cycle of this species' populations. The Development Site is likely used for dispersal of the species, however, as the proposal will not isolate any patches of habitat and as rehabilitation will occur progressively within the Development Site it is unlikely that there will be a significant impact on movement of the species.

Table A6 3: Significant impact criteria assessment – Endangered Frogs

Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The removal of potential habitat within the Development Site is part of a larger area of habitat associated with the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown. Additionally, the Development Site will be progressively rehabilitated post extraction. As such, it is considered unlikely that the proposed action will impact the species habitat such that its extent is likely to decline.
Result in invasive species that are harmful to a critical endangered species becoming established in the critically endangered species' habitat	The Plague Minnow <i>Gambusia holbrooki</i> is an introduced egg and tadpole predator, and it is considered due to other Uperoleia are moderately impacted by Plague Minnow (TSSC 2020). The proposed Activity is unlikely to result in the increased occurrence of the Plague Minnow.
Introduce disease that may cause the species to decline	Susceptibility to the amphibian chytrid fungus (<i>Batrachochytrium dendrobatidis</i>) is unconfirmed in Mahony's Toadlet (TSSC 2020). It is unlikely that the proposal will result in the introduction of chytrid fungus. Mitigation measures are within the existing management plan to ensure any survey works conducted in Frog habitat adhere to appropriate control measures.
Interfere substantially with the recovery of the species	There is no National Recovery Plan program for this species, however habitat loss, disturbance and modification are listed as a threat in the NSW Save our Species program and threat information. The proposed works will not remove, disturb or modify any habitat critical for this species and therefore will not interfere substantially with the recovery of the species.
Conclusion	The proposed works are unlikely to result in a significant impact to these species as: - the works will not have a significant impact on the size, area, populations or increase isolation of these species; and - no critical habitat will be directly impacted on.

F2 Vulnerable Species – EPBC Act Assessment of Significance

The EPBC Act Significant Impact Guidelines (DotE 2013) state:

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- lead to a long-term decrease in the size of an important population of a species
- reduce the area of occupancy of an important population
- fragment an existing important population into two or more populations
- adversely affect habitat critical to the survival of a species
- 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
- result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
- introduce disease that may cause the species to decline, or
- interfere substantially with the recovery of the species.

An 'important population' is 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.

Significant impact criteria assessment – *Eucalyptus parramattensis* subsp. *decadens* (Earp's Gum)

Species assessed	<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>
Criteria	Discussion
Lead to a long-term decrease in the size of a population	This species has been identified within the approved quarry footprint and surrounding areas as it was used in the seed mix during rehabilitation for previous mining operations. The population within the Development Site is not considered an important population as it is not near the limits of this species range. The 11 individuals identified within the Development Site are a result from rehabilitation actions and account for 33% of the <i>E. parramattensis</i> subsp. <i>decadens</i> plants recorded within the Study Area (33 plants). The naturally occurring individuals within the northern portion of the Project Area (outside the Development Site) likely form part of an important population of the species within the Tomago Area.
Reduce the area of occupancy for an important population	As the individuals within the Development Site are not considered to form part of an important population, the proposal will not reduce the area of occupancy of an important population.
Fragment an existing important population into two or more populations	The Development Site has not been identified as supporting an important population of the species, as such it will not fragment an important population.
Adversely affect habitat critical to the survival of a species	The planted specimens occur within regenerating forest and is not considered critical to the survival of the species as it is not its naturally occurring habitat. Higher quality habitat occurs outside the Development Site, in the northern portion of the Project Area within the Tomago Sand Swamp Woodland. This area of habitat will not be impacted on due to the proposal.
Disrupt the breeding cycle of an important population	The Development Site has not been identified as supporting an important population of this species.
Modify, destroy, remove, isolate or decrease the availability of habitat to the extent that the species is likely to decline.	A small area (2.20 ha) of marginal habitat (Vegetation Zone 1 and 2) and eleven (11) individuals of <i>Eucalyptus parramattensis</i> subsp. <i>decadens</i> will be removed due to the proposal. Due to the relatively small impact on habitat in which the species has been planted, it is unlikely to decrease the availability of habitat to the extent that the species is likely to decline. Higher quality habitat occurs outside the Development Site, in the northern portion of the Project Area within the Tomago Sand Swamp Woodland. This area of habitat will not be impacted on due to the proposal.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Weed invasion has been identified as a threat to these species. Based on the proposed mitigation measures it is not expected that the works will result in an increase of invasive species.
Introduce disease that may cause the species to decline	It is unlikely that a disease that could cause the species to decline would be introduced (e.g. Phytophthora or Myrtle Rust) would be introduced due to the proposed Action. All machinery being used for the operational works of the Quarry are on site.
Interfere substantially with the recovery of the species	Habitat loss and fragmentation resulting from land clearing development, particularly sand mining, road construction and residential/industrial developments is identified as a main threat for this species. The proposed works will remove approximately 2.20 ha of marginal habitat and one individual. This loss of this planted individual and small area of habitat is not considered to Interfere substantially with the recovery of the species.

Significant impact criteria assessment – *Eucalyptus parramattensis subsp. decadens* (Earp's Gum)

Conclusion	The proposed works are unlikely to result in a significant impact to these species as: • A total of eleven (11) planted individuals will be removed (33% of the 33 plants identified within the Study Area). • there is a small direct impact of 3.36 ha of habitat to be removed • the works will not have a significant impact on important populations size, area or increase isolation of this species • no listed important habitat will be directly impacted on • the proposed action will not disrupt the breeding cycle of this species, and • mitigation measures including well identified exclusion zones and weed management plan are proposed.
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Table A6 4: Significant impact criteria assessment - Vulnerable mammal (New Holland Mouse)

Species assessed	New Holland Mouse (<i>Pseudomys novaehollandiae</i>)
Criteria	Discussions
Lead to a long-term decrease in the size of an important population of a species	The species was not detected within the development footprint during surveys, however in previous surveys within the Newcastle Sand property, the species was detected on two occasions. In addition, historic records on the species are present in the locality. With reasonably frequent fires occurring within the Project Area (historically) and the Locality the Development Site and the Project Area contain suitable habitat for the species. The individuals within the Project Area form part of the Port Stephens metapopulation of the species. Due to the relatively small area of habitat removal (2.88 ha) in the context of the surrounding Project Area and the adjacent Tilligerry SCA, it is unlikely that the proposal will lead to the long-term decline in the population.
Reduce the area of occupancy for an important population	A small area of suitable habitat will be removed, this area has some connectivity to the larger tracts of vegetation within the approved On-Site Offset and is directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. The proposed works will remove approximately 2.88 ha of suitable habitat for this species, and as the habitat is surrounded by larger areas of higher quality habitat it is unlikely to reduce the area of occupancy within the local area.
Fragment an existing important population into two or more populations	The vegetation within the Development Site is part of a larger patch of vegetation in the local area including the approved On-Site Offset, directly connected to extensive areas of forested habitat within the Tilligerry SCA and adjacent areas around Tomago and Williamstown that provide connectivity and movement corridors. Within the locality, the proposal will not impact on connectivity, as there is no movement corridor through The Project Area north-south, as there is no connected vegetation on the southern site of Cabbage Tree Road. The Proposed Modification has the potential to increase fragmentation of habitat on a local scale, within The Project Area. The habitat occurring within the centre on the eastern border of the western extension, will be cut off from other vegetation temporarily. Additionally, as the proposed Development Site will be progressively rehabilitated post extraction, impacts on local connectivity will be temporary. As such, impacts on connectivity are unlikely to being significant.
Adversely affect habitat critical to the survival of a species	Due to the small are of habitat occurring within the Development Site (2.88 ha) and considering the large area of suitable habitat within the surrounding On-Site Offset and adjacent Tilligerry SCA, it is unlikely that the proposed Action will adversity affect habitat critical to the survival of the species.

Table A6 4: Significant impact criteria assessment - Vulnerable mammal (New Holland Mouse)

Disrupt the breeding cycle of an important population	Due to the stage nature and relatively small area of habitat removal, in the context of the available habitat in the area, it is unlikely that any potential disruption to the species breeding will be significant.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The removal of potential habitat within the Development Site is part of a larger area of habitat associated with the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamstown. Additionally, the Development Site will be progressively rehabilitated post extraction. As such, it is considered unlikely that the proposed action will impact the species habitat such that its extent is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Red Fox, Feral cat (<i>Felis catus</i>) and Wild dog (<i>Canis lupus familiaris</i>) are listed a known threats to the New Holland Mouse. A predator control program has already been implemented within the current Biodiversity Management Plan for the Newcastle Sand Quarry, this area is to be extended into the current Study Area.
Introduce disease that may cause the species to decline	No introduced diseases have been identified for as impacting the New Holland Mouse.
Interfere substantially with the recovery of the species	The temporary removal of 2.88 ha of habitat for the species is unlikely to interfere with its recovery. Additionally, the progressive rehabilitation of the extraction area will create areas of suitable habitat for the species in the future.
Conclusion	The proposed works are unlikely to result in a significant impact to New Holland Mouse as: - the works will not have a significant impact on the size, area, populations or increase isolation of these species; and - no critical habitat will be directly impacted on.

Table A6 5: Significant impact criteria assessment - Grey-headed Flying-fox (*Pteropus poliocephalus*)

Species assessed	Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)
Criteria	Discussions
Lead to a long-term decrease in the size of an important population of a species	The Development Site represents potential foraging habitat (0.74 ha) for the species. The Grey-headed Flying-fox was identified foraging in a <i>Banksia serrata</i> during field surveys. It is unlikely that the proposed Development Site contains an important population of the species as they are not at the extent of the species' ranges, they are unlikely to be key source populations and unlikely to be necessary for maintaining genetic diversity.
Reduce the area of occupancy for an important population	No important populations of these species have been identified within the Development Site.
Fragment an existing important population into two or more populations	No important populations of these species have been identified within the Development Site.

Table A6 5: Significant impact criteria assessment - Grey-headed Flying-fox (*Pteropus poliocephalus*)

Adversely affect habitat critical to the survival of a species	Due to the small are of habitat occurring within the Development Site (0.74 ha) and considering the large area of suitable habitat within the surrounding On-Site Offset and adjacent Tilligerry SCA, it is unlikely that the proposed Action will adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	No important populations of these species have been identified within the Development Site.
Modify, destroy, remove, isolate or decrease the availability habitat to the extent that the species is likely to decline	The removal of potential habitat within the Development Site is part of a larger area of habitat associated with the On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown. As such, it is considered unlikely that the proposed action will impact the species habitat such that its extent is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	A predator control program has already been implemented within the current Biodiversity Management Plan for the Newcastle Sand Quarry, this area is to be extended into the current Study Area.
Introduce disease that may cause the species to decline	The Australian bat Lyssavirus (ABL) is identified in the Conservation Advice for the Grey-headed Flying listed as a minor threat to this species. The incidence of ABL very low whilst (TSSC 2001) and it is not considered the actions from the construction and operation of the project will introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species	As listed under Recovery Objective 1 of the Grey-headed Flying Fox Recovery Plan, <i>Foraging habitat loss and degradation pose the most significant threat to Grey-headed Flying-foxes. There is evidence that winter and spring are periods of limited food availability and are therefore likely to be population limiting periods for the species</i> (DAWE 2021). The proposed works will remove approximately 0.74 ha of potential foraging habitat for this species. This area to be cleared is considered relatively low compared to the available forging habitat within the surrounding On-Site Offset, Tilligerry SCA and adjacent areas around Tomago and Williamtown. It is considered the removal of this vegetation will not interfere substantially with the recovery of the species.
Conclusion	The proposed works are unlikely to result in a significant impact to Grey-headed Flying-fox as: - the works will not have a significant impact on the size, area, populations or increase isolation of these species; and - no critical habitat will be directly impacted on.

APPENDIX 9. BAM FIELD SHEETS

Q1

11/12/23

A0

20

✓ Data entered 12/12/23
DP.

Vegetation Type:

F1 Coastal Blackbutt Apple

Property Name or Project Name:

Hardy

[illegible]

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ...100%).

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

Quadrat Number:

Q2

Date:

11/12/2023

Recorder:

AO

✓ Data entered 12/12/23
DP.

Vegetation Type:

Heath 1

Property Name or Project Name:

Handes

Overstorey Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Exotic		
	F	Ab		F	Ab		F	Ab		F	Ab		F	Ab		F	Ab
✓ Allo lit	0.1	1	✓ Lepto 1	60	50	✓ Ac long	2	20	✓ Blue grass	0.1	20	✓ Not woalsia	0.2	50	✓ Pine tree	0.1	1
			✓ Lepto hairy	10	20	✓ Pers lin	0.5	5	(sample)			✓ Pomax	0.1	50			
						✓ Sticky pea	0.5	10				✓ Wh umb fl	0.1	10			
						✓ Monoto	0.2	10	✓ Cyper	0.2	50	✓ Hibbertia	0.2	50			
						✓ Banksia	0.1	1				✓ Wax fl (pink)	0.2	50			
						✓ Serrata			✓ Lom gland	0.1	5	✓ Leuco app	0.2	20			
						✓ Ac ulic	0.1	5				✓ Dianella	0.1	20			
						✓ Div ulic	0.1	5				✓ Ricino	0.2	10			
												✓ Disc leafless	0.1	2			
												✓ Hibb fine leaf	0.1	20			
												✓ Flannel fl	0.1	5			
												✓ Lom long	0.1	5			
												✓ Lepto 2					
												✓ Epacrid	0.2	10			
												(leaf margin)					
												✓ Leafless	0.1	2			
												✓ Variable leaf	0.1	10			
												pea					

Acacia Spikey = confirmed as Acacia ulcifolia (Prickly Moses)

Bipinnate acacia = Acacia terminalis (Sunshine Wattle)

Cyper. = Schoenus ericetorum (Heath Bog-rush)

Dianella = Dianella caerulea (Blue Flax-lily)

Discolours shrub (pea) = Aotus ericoides

Hibbertia Curly = Hibbertia linearis

Hibbertia Fine-leaf = Hibbertia fasciculata

Leafless Forb = Amperea xiphoclada var. xiphoclada

Lepto 1 Tea Tree = Gaudium laevigatum

Leptospermum Hairy = Leptospermum polygalifolium (Tantoon)

Leuco app (white flower) = Leucopogon ericoides (Pink Beard-heath)

Myoporum = Myoporum acuminatum (Boobialla)

Not Woalsia = Astroloma pinifolium (Pine Heath)

Pimelea (Fluffy Seed Shrub) = Pimelea linifolia

Poa sp. Bluegrass = Eragrostis curvula (African Lovegrass)

Variable Leaf Pea = Bossiaea rhombifolia & Bossiaea heterophylla

Wax flower shrub = Euryomyrtus ramosissima (Rosy Baeckea)

White umbel flower = Platysace ericoides

Epacrid (leaf margins) = Monotoca elliptica

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ...100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m² = 2.5%; 20 m² = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

✓ = Sample

✓ Data entered 19/1/24
OP

Quadrat Number: Q3

Date: 19/1/24

Recorder: D. Plunkett + A. Owens

Vegetation Type: PCT 3544

Property Name or Project Name: Hordes ext.

Esignata

Red gum

Blackbutt

Blackbutt

Sample likely blackbutt.

Overstorey Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Exotic		
	F	Ab		F	Ab		F	Ab		F	Ab		F	Ab		F	Ab
C. gum	2	2	Monotoca ellip.	20	20	Acacia ulicifolia	0.2	5	Lom. longifolia	10	20	Pomax umbellata	0.1	10			
Scribbly gum	9	1	✓ Mistletoe (2)	0.1	2	Drill. retort.?			Pomax umbellata			Dinnella car.	5	20			
A. costata	2	3	Lepto. poly.	1	4	Protus. eric.	0.2	2	Lom. glauca	0.1	3	Dodd sp.					
E. paramattensis	1	2	Acacia longi.	1	2	Drill. retort.	0.1	2	Shoenus ericif.	0.1	1	Cuscuta					
E. pilularis	15	3	✓ Mistletoe (3)	0.1	1	Euryomyrtus ram.	0.1	1				Cassytha glaberr.					
Stringybark?	1		Ricinocarpus pin.			Leuco. eric.	0.1	2				✓ Cuscuta camp (1)	0.1	3			
						Amperea xiph.	0.1	5				Parsonsia stam.	1	2			
						Ricinocarp. pin.	0.1	1				Pandorea pand.	0.1	5			
												Platysace. eric.	0.1	1			
												Actinotus. hel.	0.1	1			

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ...100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m² = 2.5%; 20 m² = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments: Bossinea heterophylla just outside plot.

Canopy cover = 30%

Midstorey cover = 25%

Ground cover = 15%

Quadrat Number:

Q4

Date:

9/5/24

Recorder:

AO

Vegetation Type:

Exotic Grass

Property Name or Project Name:

Hardeo NS Exl

Overstorey Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Exotic		
	F	Ab		F	Ab		F	Ab		F	Ab		F	Ab		F	Ab
			<i>Ozothamnus diosmifolius</i>			<i>Cassinia</i>	0.1	1	<i>Lom long</i>	0.1	2	<i>Pom umb</i>	0.2	20	<i>Pall eragrostis</i>		
			<i>H. fasciculata</i>			<i>Hibbertia</i>	0.1	5	<i>Lom glauc</i>	0.1	2	<i>Solanum</i> ^{photo}	0.1	1	<i>blue grass</i>		
						<i>(Not wholsig)</i>	0.1	3	<i>Cyper</i>	0.1	2	<i>Artin elian</i>	0.1	5	<i>red natal</i>	2	200
						<i>Astropinni</i>			<i>Shoenus eric-etorum</i>						<i>Call erag</i>		
			<i>Gaudium levigatum</i>			<i>Lea tree</i>	0.1	10	<i>Yellow</i>	5	100	<i>Peridium</i>	0.1	5	<i>Era curv</i>	40	35/10000
						<i>Leptod</i>			<i>eragrostis</i>						<i>(blue grass)</i>		
						<i>Spike shrub</i>	0.1	10	<i>Eragrostis brownii</i>			<i>Dianella</i>	0.1	5	<i>blue grass</i>	25	10000
						<i>Monotoca scaparia</i>			<i>grass</i>			<i>Caerulea</i>			<i>dense flowerhead</i>		
						<i>Long thin</i>	0.1	5	<i>Eragrostis curvula</i>						<i>Eragrostis curvula</i>		
						<i>leaf</i>											
						<i>Hibbertia linearis</i>											
						<i>Spike leuc</i>	0.1	5									
						<i>(ericoides)</i>											
						<i>Confirmed - L. ericoides</i>											
						<i>Ac long</i>	0.1	1									
						<i>(Pea round leaf)</i>	0.1	1									
						<i>Boss (horat)</i>											
						<i>Monot ellip</i>	0.1	5									
						<i>Persoonia linearis</i>	0.1	1									

40/10,000
+
45/10,000
= 85/10,000
+
25/10,000
= 110/10,000
TOTAL = 70/20,000

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ... 100%).

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc (numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

Quadrat Number:

Q5

Date:

May
13-5-24

Recorder:

A0

Date entered 14/5/24, DP

Vegetation Type:

Native

Property Name or Project Name:

Hardes

Overstorey Species			Midstorey Species			Ground Cover (Shrubs)			Ground Cover (Grasses)			Ground Cover (Other)			Exotic		
	F	Ab		F	Ab		F	Ab		F	Ab		F	Ab		F	Ab
						Tea tree			E. brownii	2	200	Dinnella	0.15	50	E. curvula	4	100
						Lepido/Gaud	5	200	Shoen			Cherula					
						Peppercorn lin	1	100	Cyper eric	0.1	5	Pom umb	0.1	20	Hairy blue grass		
						Dill oak	0.2	20	Lom glauc	0.1	2	Flannelflow	0.1	10	Red nabel	0.15	100
						Platy scap			Themed	0.1	2	L					
						Monot elli	15	2100	trian-solva								
						Hibbertia	1	100									
						(long thin leaf)											
						linparis											
						Boss rhom	7	200									
						Net woodia	1	100									
						Astrology											
						Ac long	1	50									
						Leuco appr	0.5	50									
						Perso lance	1	50									
						(broad leaf)											
						Hibbertia	1	100									
						(fine small leaf)											
						fasciculata											

F Foliage Projective Cover: within the boundaries of the plot including all attached plant material, alive or dead, rooted in or overhanging the plot. Cover should be recorded in decimals if less than 1% (0.1, 0.2, 0.3), in whole numbers up to 5% (1, 2, 3), to the nearest 5% if >5% (5, 10, 15, 20, 25, ... 100%).
64 cm x 64 cm = 0.1%; 1 m x 1 m = 0.25%; 10 m² = 2.5%; 20 m² = 5%.

Ab Abundance Rating (no. of individuals or shoots rooted within the plot): 1-10, 20, 50, 100, 500, 1000, 1500, 2000 etc
(numbers > 20 are estimates only, and the recorded abundance is the upper end of each class, e.g. 50 represents an estimated abundance of between 20 and 50)

General Comments:

1,000 m² PLOT

Tree Stem Size Class*		Trees [^]
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	0
	50+ cm	0
All other Trees: Only record presence or absence of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	0
	20-29 cm	0
	10-19 cm	0
	5-9 cm	0
Presence or absence of Regeneration[#] Maximum stem diameter of <5 cm regardless of height.	<5 cm	0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

[#]Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedlings that are <1.3 m high and have DBH <5 cm).

[^]Includes species classified as Trees under the BAM Growth Form Table.

Count of HBTs [†]
0

[†]Count of **hollow-bearing trees** and **shrubs**; includes living and dead; record by stem size class.

Length of logs (m)	Tally	TOTAL LENGTH (m)
Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m ² plot. Only the length of log within the plot is recorded.	0m	0m

1 m² sub PLOT

	Litter cover (%)				
Subplot	10	5	5	5	15
Average					

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q4

Date: 9/5/2024

Recorder: D. Plunkett

Property Name or Project Name: Hards NS



Both Start and End points collected on GPS



Start and End locations are approximately 50 m apart on GPS

1,000 m² PLOT

Tree Stem Size Class*		Trees [^]
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	0
	50+ cm	0
All other Trees: Only record presence or absence of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	0
	20-29 cm	0
	10-19 cm	0
	5-9 cm	✓
Presence or absence of Regeneration[#] Maximum stem diameter of <5 cm regardless of height.	<5 cm	0

*Banksia serrata

Count of HBTs [†]
0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

[#]Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedlings that are <1.3 m high and have DBH <5 cm).

[^]Includes species classified as Trees under the BAM Growth Form Table.

[†]Count of **hollow-bearing trees** and **shrubs**; includes living and dead; record by stem size class.

Length of logs (m)	Tally	TOTAL LENGTH (m)
Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m ² plot. Only the length of log within the plot is recorded.	0m	0m

1 m² sub PLOT

	Litter cover (%)				
Subplot	15	5	5	30	20
Average					

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: QS

Date: 13/05/2024

Recorder: D. Plunkett

Property Name or Project Name: NS Hardes



Both Start and End points collected on GPS



Start and End locations are approximately 50 m apart on GPS

1,000 m² PLOT

Tree Stem Size Class*		Trees [†]
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	
	50+ cm	HT 1
All other Trees: Only record presence or absence of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	✓
	20-29 cm	✓
	10-19 cm	✓
	5-9 cm	
Presence or absence of Regeneration[#] Maximum stem diameter of <5 cm regardless of height.	<5 cm	✓

Count of HBTs [†]
0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

[#]Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedlings that are <1.3 m high and have DBH <5 cm).

[†]Includes species classified as Trees under the BAM Growth Form Table.

[†]Count of **hollow-bearing trees** and **shrubs**; includes living and dead; record by stem size class.

Length of logs (m)	Tally	TOTAL LENGTH (m)
Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m ² plot. Only the length of log within the plot is recorded.	3	3

1 m² sub PLOT

	Litter cover (%)				
Subplot	75	90	65	95	85
Average	82				

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q1

Date: 11/12/2023

Recorder: D. Plunkett

Property Name or Project Name: Hades



Both Start and End points collected on GPS



Start and End locations are approximately 50 m apart on GPS

✓ Data entered 12/12/23
DP.

1,000 m² PLOT

Tree Stem Size Class [*]		Trees [^]
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	
	50+ cm	
All other Trees: Only record presence or absence of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	
	20-29 cm	
	10-19 cm	
	5-9 cm	✓
Presence or absence of Regeneration[#] Maximum stem diameter of <5 cm regardless of height.	<5 cm	

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

[#]Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedlings that are <1.3 m high and have DBH <5 cm).

[^]Includes species classified as Trees under the BAM Growth Form Table.

Count of HBTs [†]
0

[†]Count of **hollow-bearing trees** and **shrubs**; includes living and dead; record by stem size class.

Length of logs (m)	Tally	TOTAL LENGTH (m)
Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m ² plot. Only the length of log within the plot is recorded.	0	0m

1 m² sub PLOT

	Litter cover (%)				
Subplot	15	80	100	95	90
Average	76				

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q2

Date: 11/12/2023

Recorder: D-Plunkett

Property Name or Project Name: Hardey



Both Start and End points collected on GPS



Start and End locations are approximately 50 m apart on GPS

1,000 m² PLOT

Tree Stem Size Class*		Trees [^]
Count of Large Trees Record DBH of each tree at 1.3 m from ground.	80+ cm	0
	50+ cm	III
All other Trees: Only record presence or absence of trees in these stem size classes. Record DBH of each tree at 1.3 m from ground.	30-49 cm	✓
	20-29 cm	✓
	10-19 cm	✓
	5-9 cm	0
Presence or absence of Regeneration[#] Maximum stem diameter of <5 cm regardless of height.	<5 cm	✓

Count of HBTs [†]
0

*Living trees only; for **multi-stemmed trees**, only largest stem is counted or recorded as present;

[#]Record presence of regeneration for any tree with a maximum stem diameter of <5 cm, regardless of height (i.e., record presence of regeneration if sapling or seedlings that are <1.3 m high and have DBH <5 cm).

[^]Includes species classified as Trees under the BAM Growth Form Table.

[†]Count of **hollow-bearing trees** and **shrubs**; includes living and dead; record by stem size class.

Length of logs (m)	Tally	TOTAL LENGTH (m)
Fallen logs = >10 cm diameter, that is dead and entirely or partly on the ground within the 1,000 m ² plot. Only the length of log within the plot is recorded.	8m	8m

1 m² sub PLOT

	Litter cover (%)
Subplot	100 100 95 100 100
Average	

Litter includes leaves, seeds, twigs, branchlets and branches **less than 10 cm diameter**. Include all plant material that is detached from a plant and forms part of the litter layer on the ground surface. Litter cover is the two-dimensional litter layer in contact with the ground surface, including litter under the canopies of erect plants. Plant material that is not detached should be assessed as foliage cover, regardless of whether it appears alive or dead.

Quadrat Number: Q3

Date: 19/1/24

Recorder: D. Plunkett + A. Owens

Property Name or Project Name: Hardees



Both Start and End points collected on GPS



Start and End locations are approximately 50 m apart on GPS

APPENDIX 10. STAFF CONTRIBUTIONS

The following staff were involved in the project:

Name	Qualifications	Title	Contribution
Ashley Owen	BSc (Ecology) Accredited BAM Assessor	Ecologist	Vegetation mapping, flora surveys, preparation of report
George Plunkett	BSc (Hons) PhD Accredited BAM Assessor	Senior Ecologist	Vegetation mapping, flora surveys and preparation of report. Case party owner.
Jake Mauger	BEnvSc & Mgt	Ecologist	Flora and fauna surveys
Olivia Szekelyhidy	B Zoology	Ecologist	Fauna Surveys and reporting
Debbie Plunkett	BSc	Ecologist	Flora and Fauna Surveys
Theo Tasoulis	BSc PhD	Senior Ecologist	Flora and Fauna Surveys
Samara Schulz	BEnvSc & Mgt (Hons) Accredited BAM Assessor	Principal Botanist	Report Review
Kane Blundell	Grad Dip Spatial Science	GIS Analyst	Preparation of figures and area calculations
Carla Robertson	BEnvSc & Mgt	Ecologist	Flora Surveys
David Martin	MSc BEnvSc & Mgmt and MSc Accredited BAM Assessor	Senior Ecologist	Koala habitat assessments, Assistance with report Report Author
Rachael Neal	BBSc (Hons)	Ecologist	Flora and fauna assessments
Mark Dean	BEnvSc & Mgt Accredited BAM Assessor	Senior Ecologist	Fauna survey assessments and Report Review

APPENDIX 11. SCIENTIFIC LICENCING AND PERMITS

Wedgetail employees involved in the current study are licensed or approved under the *Biodiversity Conservation Act 2016* (License Number: SL102506, Expiry: 31 May 2026) and the *Animal Research Act 1985* to harm/trap/release protected native fauna and to pick for identification purposes native flora and to undertake fauna surveys.