Travers

bushfire & ecology

Biodiversity Certification Assessment Report

Lot 5 DP 1228880
45 Mulloway Drive
Chain Valley Bay

August 2021
(REF: 18CP02BCA)

Biodiversity Certification Assessment Report

Lot 5 DP 1228880, 45 Mulloway Drive
Chain Valley Bay

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File:	18CP02BCA

Disclaimer:

This report has been prepared to provide advice to the client on matters pertaining to the particular and specific development proposal as advised by the client and / or their authorised representatives. This report can be used by the client only for its intended purpose and for that purpose only. Should any other use of the advice be made by any person, including the client, then this firm advises that the advice should not be relied upon. The report and its attachments should be read as a whole and no individual part of the report or its attachments should be interpreted without reference to the entire report.

The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

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Executive Summary

Travers bushfire & ecology has been engaged to undertake a biodiversity certification assessment within Lot 5 DP 1228880, at 45 Mulloway Drive, Chain Valley Bay within the Central Coast local government area (LGA). The extent of subject lot is shown in Figure 1.1. This lot is subject to a proposed biodiversity certification to account for future impacts on biodiversity caused by proposed re-zoning, subdivision and development, and will hereafter be referred to as the 'study area'.

The area containing the proposed Manufactured Home Estate (MHE) village and residential subdivision, inclusive of lots, internal roads and APZs, is hereafter referred to as the 'subject land' (see Figure 1.6).

For the purposes of Biodiversity certification, the proposal is assessed under the *Biodiversity Conservation Act* (*BC Act*), 2016 using the Biodiversity Assessment Method 2020 (BAM).

Planning Proposal

A planning proposal is proposed that seeks to establish a new residential lifestyle village, comprised of home sites occupied by manufactured homes, clubhouse and community facilities.

The planning proposal seeks to amend Wyong Local Environmental Plan (LEP) 2013 to:

1. Rezone suitable areas of the land to RE2 to facilitate development of the land for the purposes of a Manufactured Home Estate, and R2 to allow low-density residential lots.
2. Extend the E2 Environmental Conservation Zone along the southern parts of the site to protect Endangered Ecological Communities and the east–west corridor along Karignan Creek.
3. Amend the lot size control in the area proposed to be rezoned R2 to 450 m^2.

The concept plan includes several home sites (234 m^2) in the centre and south of the site, with larger residential lots proposed (450–1000 m^2) in the north of the site, which will be developed independently from the Manufactured Home Estate (MHE) community (Figure 1.6). The vegetation near the southern boundary adjacent to Karignan Creek will be retained.

Access to the site will be provided via a northern access from Mulloway Drive, and another in the south via Chain Valley Bay Road (Figure 1.6).

Recorded biodiversity

Ecological survey and assessment has been undertaken in accordance with the *Biodiversity Assessment Methodology* (BAM) as well as relevant legislation including the *Environmental Planning and Assessment Act 1979* (*EP&A Act*), the *Biodiversity Conservation Act 2016* (*BC Act*), the *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) and the *Fisheries Management Act 1994* (*FM Act*). Compliant survey and limitations for candidate species are explained in Sections 2.5 and 2.6. More detail on survey compliance for the BAM is given in Section 4.2.2 (flora) and Section 4.3.3 (fauna).

In respect of matters required to be considered under the *EP&A Act* and relating to the threatened species and communities listed and provisions of the *BC Act*, five (5) threatened

fauna species were recorded present during survey including Masked Owl (*Tyto novaehollandiae*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Little Bent-winged Bat (*Miniopterus australis*), Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) and Southern Myotis (*Myotis macropus*). The Eastern Coastal Free-tailed Bat was recorded to a 'probable' level of certainty. No threatened flora species, and one (1) threatened ecological community (TEC), *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-east Corner Bioregions,* were recorded within the study area.

In respect of matters required to be considered under the *EPBC Act*, no threatened fauna species, one (1) protected migratory bird species Black-faced Monarch (*Monarcha melanopsis*), no threatened flora species and no threatened ecological communities listed under this Act were recorded within the study area. The Black-faced Monarch was recorded only to a 'possible' level of certainty.

In respect of matters relative to the *FM Act*, no suitable habitat for threatened marine or aquatic species was observed within the study area.

Impact assessment

Avoidance and minimisation actions are outlined in Section 5.2. The resultant direct, indirect and cumulative ecological impacts of the proposal have been considered in Section 5.3. Further recommended measures to mitigation these impacts, to address threatening processes and to create a more positive ecological outcome for threatened biodiversity have been outlined within Section 6.2.

The proposal will see an impact on 1.17 ha of remnant native vegetation, and 5.95 ha of derived grassland, which includes impacts to four (4) different vegetation units including the following (PCT below refers to Plant Community Type):

- Zone 1: PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast (good)
- Zone 2: PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast (poor)
- Zone 3: derived grassland

The assessment of serious and irreversible impacts are set out under Section 6.7.2 of the *BC Reg 2017* to guide the determining authority on this decision. These principles have been reviewed and assessed in Appendix 2. It is considered that the proposal will not cause any serious and irreversible impacts on threatened biodiversity.

There will be no significant impact on matters listed under the *FM Act*.

The proposal was not considered to have a significant impact on matters of national environmental significance. As such a referral to Department of Agriculture, Water and the Environment should not be required.

Biodiversity Offsets Scheme (BOS) – Threshold Assessment

The proposed development exceeds the nominated threshold triggers of 1) impacting Biodiversity Values Land and 2) the Area clearing Threshold as assessed in Section 4.1. Therefore, biodiversity offsets are required under the Biodiversity Offsets Scheme (BOS). A credit assessment is included as part of this BCAR.

BAM Calculator results

The BAM Calculator provides a means of objectively determining the loss of biodiversity as a result of a proposed development. The 'credits' generated (Table A & B) is the number of credits required to be 'transferred' (purchased) to allow the proposal to proceed.

Table A – Requirement for ecosystem credits

Zone	Veg. zone name	Veg. integrity loss	Area (ha)	Sensitivity to gain	Biodiversity risk weighting	Potential SAII	Ecosystem credits
1	1636_good	64.4	0.45	High	1.75	no	13
2	1636_poor	58.8	0.72	High	1.75	no	19
4	1636_grassland	4.7	6	High	1.75	no	0
							Subtotal: 32
							Total: 32

*Note: the BAM calculator rounds impact requirements to the nearest 0.1 ha, hence the discrepancy with the values stated elsewhere in the BDAR.

Table B – Requirement for species credits

Veg. zone name	Veg. integrity loss	Area (ha) / count	Biodiversity risk weighting	Potential SAII	Species credits
***Diuris praecox* / Rough Doubletail**					
1636_good	64.4	0.45	1.5	False	11
1636_poor	58.8	0.72	1.5	False	16
					Subtotal: 27
***Lathamus discolor* / Swift Parrot**					
1636_grassland	4.7	0.03	3	True	1
					Subtotal: 1
***Myotis macropus* / Southern Myotis**					
1636_good	64.4	0.45	2	False	14
1636_grassland	4.7	6	2	False	14
1636_poor	58.8	0.72	2	False	21
					Subtotal: 49
***Petaurus norfolcensis* / Squirrel Glider**					
1636_good	64.4	0.45	2	False	14
1636_poor	58.8	0.72	2	False	21
					Subtotal: 35
Tyto novaehollandiae / Masked Owl					
1636_poor	58.8	0.04	2	False	1
					Subtotal: 1

The pricing of credits can vary greatly over time and it is advised that the proponent use the online Biodiversity Offset Payment Calculator tool to determine the current pricing of credits (https://www.lmbc.nsw.gov.au/offsetpaycalc).

List of abbreviations

APZ	asset protection zone
BAM	Biodiversity Assessment Method (2020)
BAR	Biodiversity Assessment Report
BC Act	*Biodiversity Conservation Act (2016)*
BC Reg	*Biodiversity Conservation Regulation (2017)*
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
BPA	bushfire protection assessment
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically endangered ecological community
CM Act	*Coastal Management Act 2016*
DAWE	Department of Agriculture, Water and the Environment.
DCP	development control plan
DEC	NSW Department of Environment and Conservation (superseded by DECC from April 2007)
DECC	NSW Department of Environment and Climate Change (superseded by DECCW from October 2009)
DECCW	NSW Department of Environment, Climate Change and Water (superseded by OEH from April 2011)
DEWHA	Commonwealth Department of Environment, Water, Heritage & the Arts (superseded by SEWPAC)
DOEE	Commonwealth Department of Environment & Energy (superseded by DAWE)
DPIE	NSW Department of Planning, Industry and Environment
EEC	endangered ecological community
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act (1979)*
EPBC Act	*Environment Protection and Biodiversity Conservation Act (1999)*
FM Act	*Fisheries Management Act*
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	local environmental plan
LGA	local government area
LLS Act	*Local Land Services Act (2013*)
NES	national environmental significance
NPW Act	*National Parks and Wildlife Act (1974)*
NRAR	Natural Resources Access Regulator (NSW)
NSW DPI	NSW Department of Industry and Investment
OEH	Office of Environment and Heritage (superseded by DPIE from August 2019)
PCT	plant community type
PFC	projected foliage cover
RFS	NSW Rural Fire Service
ROTAP	rare or threatened Australian plants
SAII	Serious And Irreversible Impacts
SEPP	State Environmental Planning Policy
SEWPAC	Commonwealth Dept. of Sustainability, Environment, Water, Population & Communities (superseded by DOEE)
SIS	species impact statement
SSF	Swamp Sclerophyll Forest
SULE	safe useful life expectancy
TEC	threatened ecological community
TPZ	tree preservation zone
TSC Act	*Threatened Species Conservation Act (1995) – Superseded by the Biodiversity Conservation Act (2016)*
VMP	vegetation management plan

Table of Contents

Figures

Tables

Appendices

Introduction 1

Travers bushfire & ecology has been engaged to undertake a biodiversity certification assessment within Lot 5 DP 1228880, at 45 Mulloway Drive, Chain Valley Bay within the Central Coast local government area (LGA). The extent of the lot is shown in Figure 1.1. This lot is subject to a proposed rezoning application and will hereafter be referred to as the 'study area'.

The area containing the proposed development and APZs is hereafter referred to as the 'subject land' (see Figure 1.1).

Figure 1.1 – Study area (red) and subject land (blue)

1.1 Purpose

The proponent seeks a 'standard' biodiversity certification at the rezoning stage for certainty of development at the development application stage.

The purpose of this Biodiversity Certification Assessment Report (BCAR) is to:

- Carry out a botanical survey to describe the vegetation communities and their conditions.
- Carry out a fauna habitat survey for the detection and assessment of fauna and their potential habitats.
- Complete targeted surveys for threatened species, populations and ecological communities.
- Prepare a BCAR in accordance with the requirements of the:
  a) *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*),
  b) *Biodiversity Conservation Act 2016* (*BC Act*),
  c) *Biodiversity Conservation Regulation 2017* (*BCR*),
  d) *Fisheries Management Act 1994* (*FM Act*), and
- Prepare a BCAR in accordance with the Biodiversity Assessment Method 2020 (BAM).

1.1.1 Certification of BAM compliance

Section 6.15 of the *BC Act* regarding the currency of a BCAR requires:

(1) A biodiversity assessment report cannot be submitted in connection with a relevant application unless the accredited person certifies in the report that the report has been prepared on the basis of the requirements of (and information provided under) the biodiversity assessment method as at a specified date and that date is within 14 days of the date the report is so submitted.

(2) A relevant application is an application for planning approval, for vegetation clearing approval, for biodiversity certification or in respect of a biodiversity stewardship agreement.

George Plunkett (BAAS 19010) is an accredited person under the *BC Act.* I, George Plunkett, certify here that the report has been prepared on the basis of the requirements of (and information provided under) the BAM 2020 as 4 August 2021, and that date is within 14 days of the date the report is so submitted.

1.1.2 Terminology

Throughout this report the terms subject land and study area are used. It is important to have a thorough understanding of these terms as they apply to the assessment.

Subject land is land to which the BAM is applied in Stage 1 to assess the biodiversity values. It includes land that may be a development site, clearing site, proposed for biodiversity certification or land that is proposed for a biodiversity stewardship agreement. In this case, it refers to the area designated as the development footprint and Biodiversity Certification Area and has the same meaning for the purposes of this report. The terms "subject land" and "development footprint" are interchangeable in this regard.

Development footprint means the area directly affected by the proposal. It has the same meaning as "subject land" defined below.

Study area is the portion of land that encompasses all surveys undertaken and is usually all land contained within the designated property boundary. The study area extends as far as is necessary to assess all important biodiversity values known and likely to occur within the subject land and includes the development footprint and any additional areas which are likely to be affected by the proposal, either directly or indirectly.

Direct impacts are those that directly affect the habitat and individuals. They include, but are not limited to, death through clearing, predation, trampling, poisoning of the animal/plant itself and the removal of suitable habitat. When applying each factor, consideration must be given to all of the likely direct impacts of the proposed activity or development.

Indirect impacts occur when project-related activities affect species, populations or ecological communities in a manner other than direct loss. Indirect impacts can include loss of individuals through starvation, exposure, predation by domestic and/or feral animals, loss of breeding opportunities, loss of shade/shelter, deleterious hydrological changes, increased soil salinity, erosion, inhibition of nitrogen fixation, weed invasion, fertiliser drift, or increased human activity within or directly adjacent to sensitive habitat areas. As with direct impacts, consideration must be given, when applying each factor, to all of the likely indirect impacts of the proposed activity or development.

1.2 Site description

1.2.1 Site overview

Table 1.1 examines the landscape features of the proposed development site in accordance with the biodiversity assessment methodology (BAM). The proposal will be a Part 4 development (general).

Table 1.1 – Site features

Lot / DP	Lot 5 DP 1228880
Address	45 Mulloway Road, Chain Valley Bay
Local government area	Central Coast (formerly, Wyong)
Coordinates	367600E 6328200N (GDA94) AMG zone 56
Current size of lot	10.61 ha
IBRA bioregions and subregions	Sydney Basin bioregion – Wyong subregion
NSW landscape region and area (ha)	Wyong; Gosford - Cooranbong Coastal Slopes.
Zoning	E3
Native vegetation extent in the 1,500 m buffer area	70.3%
Areas of outstanding biodiversity value	None

Cleared areas	The majority of the study area has been previously cleared for agricultural or pastoral usage. There are some existing dwellings in the study area, those in the northern portion will be retained. There are small pockets of disturbed vegetation across the property, largely along the western boundary, around the dam near the centre part of the site, and some scattered trees in the road reserve along the eastern boundary. The southern remnant of vegetation is moderate-good quality with good connectivity features and part of the Karignan Creek riparian corridor.
Evidence to support differences between mapped vegetation extent and aerial imagery	Ground-truthed vegetation closely matches aerial imagery. Interpretation of 'native vegetation' as per the *Local Land Services Act 2013* (*LS Act*) and *Biodiversity Conservation Act 2016* (*BC Act*) definition.
Connectivity features	The southern remnant has excellent connectivity features along Karignan Creek to the west of the site. It links to extensive vegetation to the east which is partly conserved within the Lake Macquarie State Conservation Area.
Patch size	at least 1000 ha (class: >100 ha) - Figure 1.10
Areas of geological significance and soil hazard features	Geology; Munmorah Conglomerate across most of the site, Quaternary Alluvium in Karignan Creek. Soils: Doyalson Soil Landscape across most of the site, Wyong Soil Landscape or Tacoma Swamp Soil Landscape along Karignan Creek. The study area provides no karst, caves, crevices, cliffs, rocks and other geological features of significance or any soil hazard features.
Identification of method applied (i.e. linear or site-based)	Site based assessment.

1.3 Planning proposal

The proponent has sought preparation of a planning proposal by Central Coast Council to facilitate development for the purposes of a Manufactured Home Estate (MHE) and additional larger lots on the subject land. The concept masterplan has been altered from the original plan (Figure 1.6) as an avoidance measure of impacts to important ecological values in the southern portion of the existing lot (Figure 1.7).

The planning proposal seeks to amend Wyong Local Environmental Plan (LEP) 2013 to:

1. Rezone suitable areas of the land to RE2 to facilitate development of the land for the purposes of a Manufactured Home Estate, and R2 to allow low-density residential lots.
2. Extend the E2 Environmental Conservation Zone along the southern parts of the site to protect Endangered Ecological Communities and the east–west corridor along Karignan Creek.
3. Amend the lot size control in the area proposed to be rezoned R2 to 450 m^2.

The concept masterplan seeks to provide for smaller style home sites (234 m^2) in the centre and south of the site associated with the MHE, with larger residential lots proposed (450–1000 m^2) in the north of the site that will be independent of the MHE (Figure 1.6). The vegetation near the southern boundary adjacent to Karignan Creek will be largely retained.

Access to the site will be provided for the MHE via access from Chain Valley Bay Road, and another access via Mulloway Road for the R2-zoned lots (Figure 1.6).

An Asset Protection Zone (APZ) is provided on the southern and northern boundaries of the development, also extending part way along the eastern and western boundary (pale yellow shown on Figure 1.6).

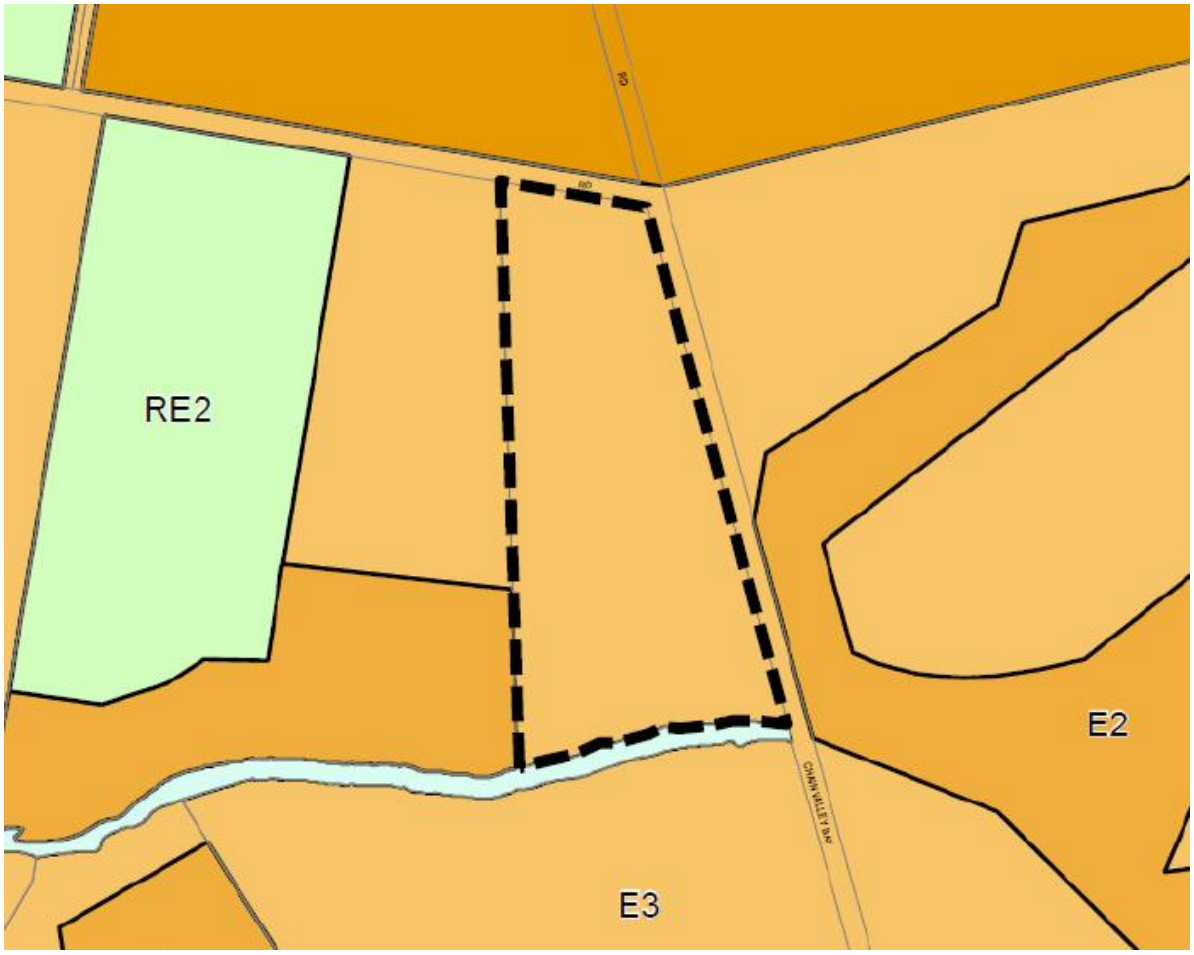

Figure 1.2 – Current zoning
(Source: Wyong LEP mapping)

1.3.1 Identification of development site footprint

1.17 ha of remnant native vegetation, plus 5.95 ha of derived grassland, will be directly impacted within the proposed MHE village and residential subdivision area. This includes impacts from clearing of lots for construction of internal roads, buildings, and other infrastructure, management of asset protection zones (APZs), and boundary fences between allotments. All areas north of the proposed E2 / RE2 boundary are assumed to be fully impacted. There are some tree canopies overhanging this boundary but they will not be impacted as the management requirements for the southern APZ will not affect these trees.

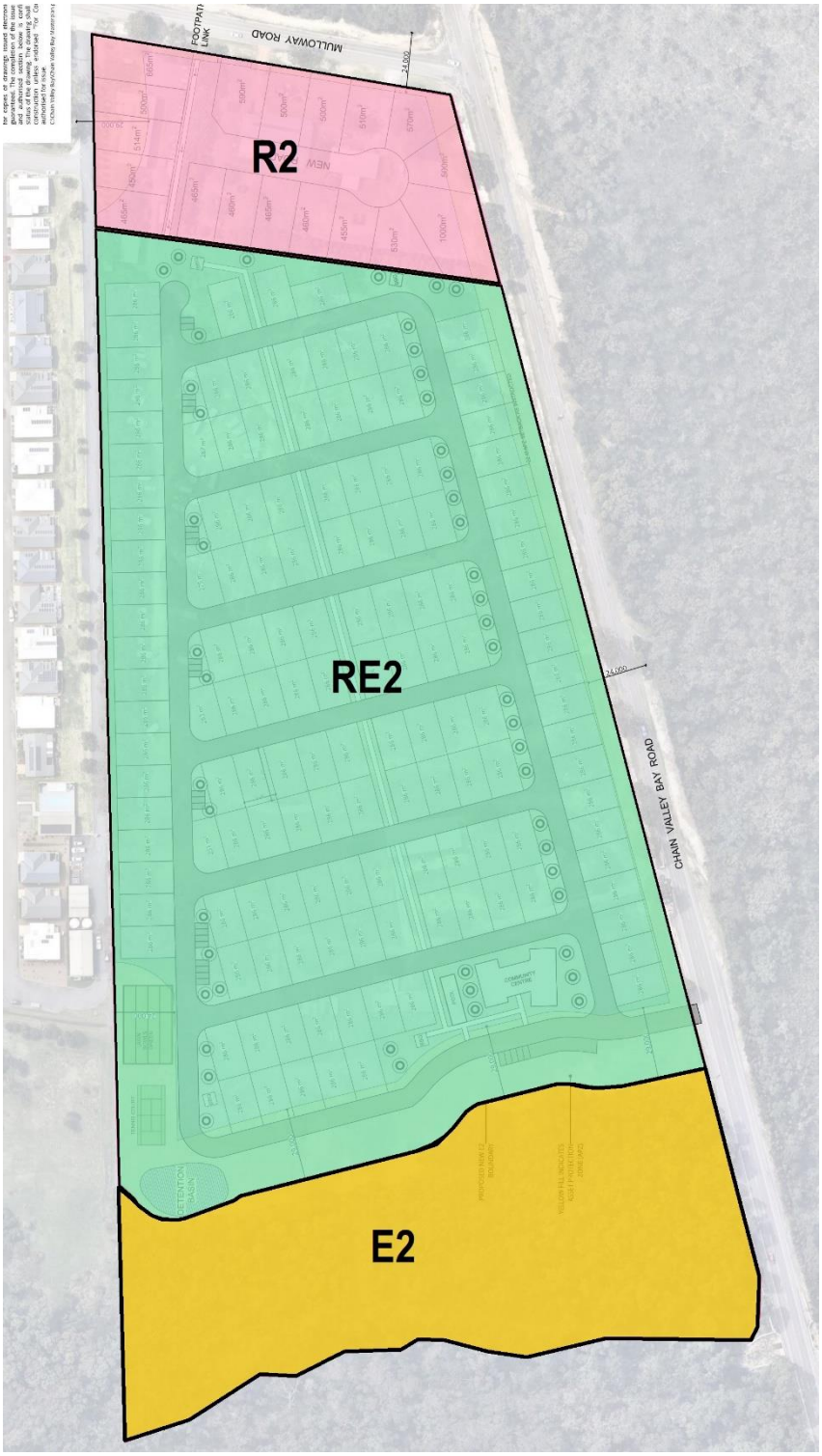

Figure 1.3 – Proposed zoning

Figure 1.4 – Gosford-Lake Macquarie geology

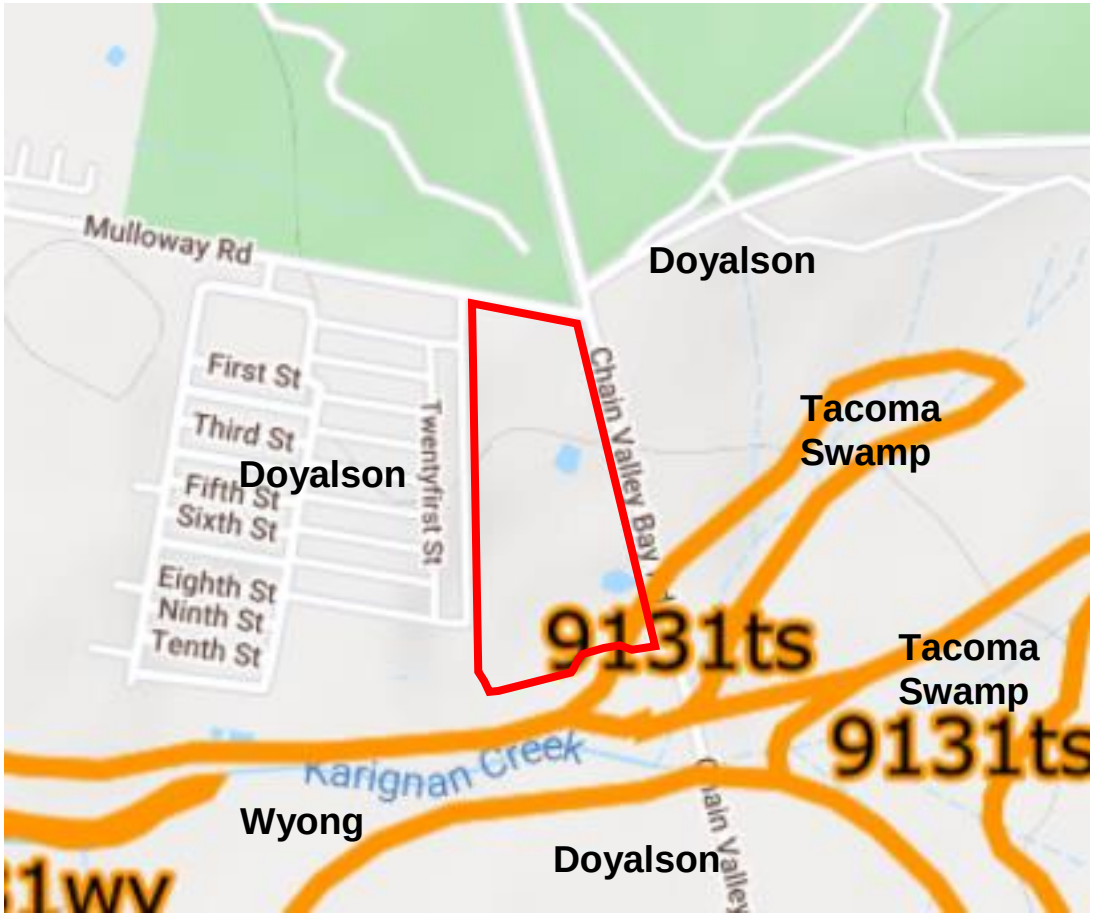

Figure 1.5 – Soil landscapes

(Source: https://www.environment.nsw.gov.au/eSpade2WebApp#)

Figure 1.6 – Original concept Masterplan
(Source – Vivacity, date not provided)

DRAWING
CONCEPT MASTERPLAN

PROJECT NO.
2021-164

LOCATION
45 MULLOWAY ROAD CHAIN VALLEY BAY NSW

DRAWING NO.
SK01

ISSUE NO.
02

SCALE
1:1500@A3

ISSUE	DESCRIPTION	BY	CHK	DATE
01	FOR COMMENT			26/07/2021
02	FOR REVIEW			27/07/2021

PROJECT
CHAIN VALLEY BAY MASTERPLAN

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Figure 1.7 – Current Concept Masterplan

(Source: Space Design Architecture, 27/07/2021)

1.3.2 E2 / RE2 zoning boundary and habitat corridor

The E2 boundary has been designed to conserve the Swamp Sclerophyll Forest, Swift Parrot habitat, and existing connective values provided by the remnant vegetation in the south of the site.

1.4 Statutory assessment requirements

1.4.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

Prior to any development taking place in New South Wales a formal assessment needs to be made of the proposed work to ensure it complies with relevant planning controls and, according to its nature and scale, confirm that it is environmentally and socially sustainable. State, regional and local planning legislation indicates the level of assessment required, and outlines who is responsible for assessing the development. The development assessment and consent system is outlined in Part 4 and the infrastructure and environmental impact assessment system is outlined in Part 5 of the *EP&A Act*.

1.4.2 Biodiversity Conservation Act 2016 (BC Act)

The *BC Act* repeals the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act 2001* and the animal and plant provisions of the *National Parks and Wildlife Act 1974*.

The *BC Act* and the *BC Reg* establishes a regulatory framework for assessing and offsetting impacts on biodiversity values due to proposed developments and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method (BAM).

The BOS applies to:

- local development (assessed under Part 4 of the *Environmental Planning and Assessment Act 1979*) that triggers a BOS threshold or is likely to significantly affect threatened species based on the test of significance in section 7.3 of the *Biodiversity Conservation Act 2016*.
- state significant development and state significant infrastructure projects, unless the Secretary of the Department of Planning, Industry 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 a BOS threshold and does not require development consent
- clearing of native vegetation that requires approval by the Native Vegetation Panel under the *Local Land Services Act 2013*.
- activities assessed and determined under Part 5 of the *Environmental Planning and Assessment Act 1979* (generally, proposals by government entities) if proponents choose to 'opt in' to the Scheme.

Proponents will need to supply evidence relating to the triggers for the BOS thresholds and the test of significance (where relevant) when submitting their application to the consent authority.

Development consent cannot be granted for non-State significant development under Part 4 of the *EP&A Act* if the consent authority is of the opinion it is likely to have serious and

irreversible impacts (SAII) on biodiversity values. The determination of SAII is to be made in accordance with principles prescribed section 6.7 of the *BC Regulation 2017*. The principles have been designed to capture those impacts which are likely to contribute significantly to the risk of extinction of a threatened species or ecological community in New South Wales.

The threatened species test of significance is used to determine if a development or activity is likely to significantly affect threatened species or ecological communities, or their habitats. It is applied as part of the Biodiversity Offsets Scheme entry requirements and for Part 5 activities under the *Environmental Planning and Assessment Act* (*EP&A Act*), 1979.

The test of significance is set out in s.7.3 of the *BC Act*. If the activity is likely to have a significant impact, or will be carried out in a declared area of outstanding biodiversity value, the proponent must either apply the Biodiversity Offsets Scheme or prepare a species impact statement (SIS).

The environmental impact of activities that will not have a significant impact on threatened species will continue to be assessed under s.111 of the *EP&A Act*

1.4.3 Fisheries Management Act 1994 (FM Act)

The *FM Act* provides a list of threatened aquatic species that require consideration when addressing the potential impacts of a proposed development. Where a proposed activity is located in an area identified as critical habitat, or such that it is likely to significantly affect threatened species, populations, ecological communities, or their habitats, an SIS is required to be prepared.

1.4.4 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The *EPBC Act* requires that Commonwealth approval be obtained for certain actions. It provides an assessment and approvals system for actions that have a significant impact on matters of *national environmental significance* (NES). These may include:

- World Heritage Properties and National Heritage Places
- Wetlands of International Importance protected by international treaty
- Nationally listed threatened species and ecological communities
- Nationally listed migratory species
- Commonwealth marine environment

Actions are projects, developments, undertakings, activities, and series of activities or alteration of any of these. An action that needs Commonwealth approval is known as a controlled action. A controlled action needs approval where the Commonwealth decides the action would have a significant effect on an NES matter.

Where a proposed activity is located in an area identified to be of NES, or such that it is likely to significantly affect threatened species, ecological communities, migratory species or their habitats, then the matter needs to be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for assessment. In the case where no listed federal species are located on site then no referral is required. The onus is on the proponent to make the application and not the Council to make any referral.

A threshold criterion apply to specific NES matters which may determine whether a referral is or is not required, such as for the *EPBC*-listed ecological communities Cumberland Plain Woodland and Shale-Gravel transition Forest. Consultation with DAWE may be required to determine whether a referral is or is not required. If there is any doubt as to the significance of impact or whether a referral is required, a referral is generally recommended to provide a

definite decision under the *EPBC Act* thereby removing any further obligations in the case of 'not controlled' actions.

A significant impact is regarded as being:

> *important, notable, or of consequence, having regard to its context or intensity and depends upon the sensitivity, value, and quality of the environment which is impacted and upon the duration, magnitude, and geographical extent of the impacts. A significant impact is likely when it is a real or not a remote chance or possibility.*
>
> *Source: EPBC Policy Statement*

Guidelines on the correct interpretation of the actions and assessment of significance are located on the department's web site http://www.environment.gov.au/epbc/publications.

1.4.5 Coastal Management Act 2016 (CM Act)

The *Coastal Management Act* (*CM Act,* 2016) establishes the framework and overarching objects for coastal management in New South Wales. The Act commenced on 29 June 2018 and replaces the previous *Coastal Protection Act* (1979).

The purpose of the *CM Act* is to manage the use and development of the coastal environment in an ecologically sustainable way, for the social, cultural and economic well-being of the people of New South Wales.

The *CM Act* also supports the aims of the *Marine Estate Management Act 2014*, as the coastal zone forms part of the marine estate.

The *CM Act* defines the coastal zone, comprising four (4) coastal management areas:

1. 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
2. coastal vulnerability area; areas subject to coastal hazards such as coastal erosion and tidal inundation
3. 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
4. coastal use area; land adjacent to coastal waters, estuaries and coastal lakes and lagoons.

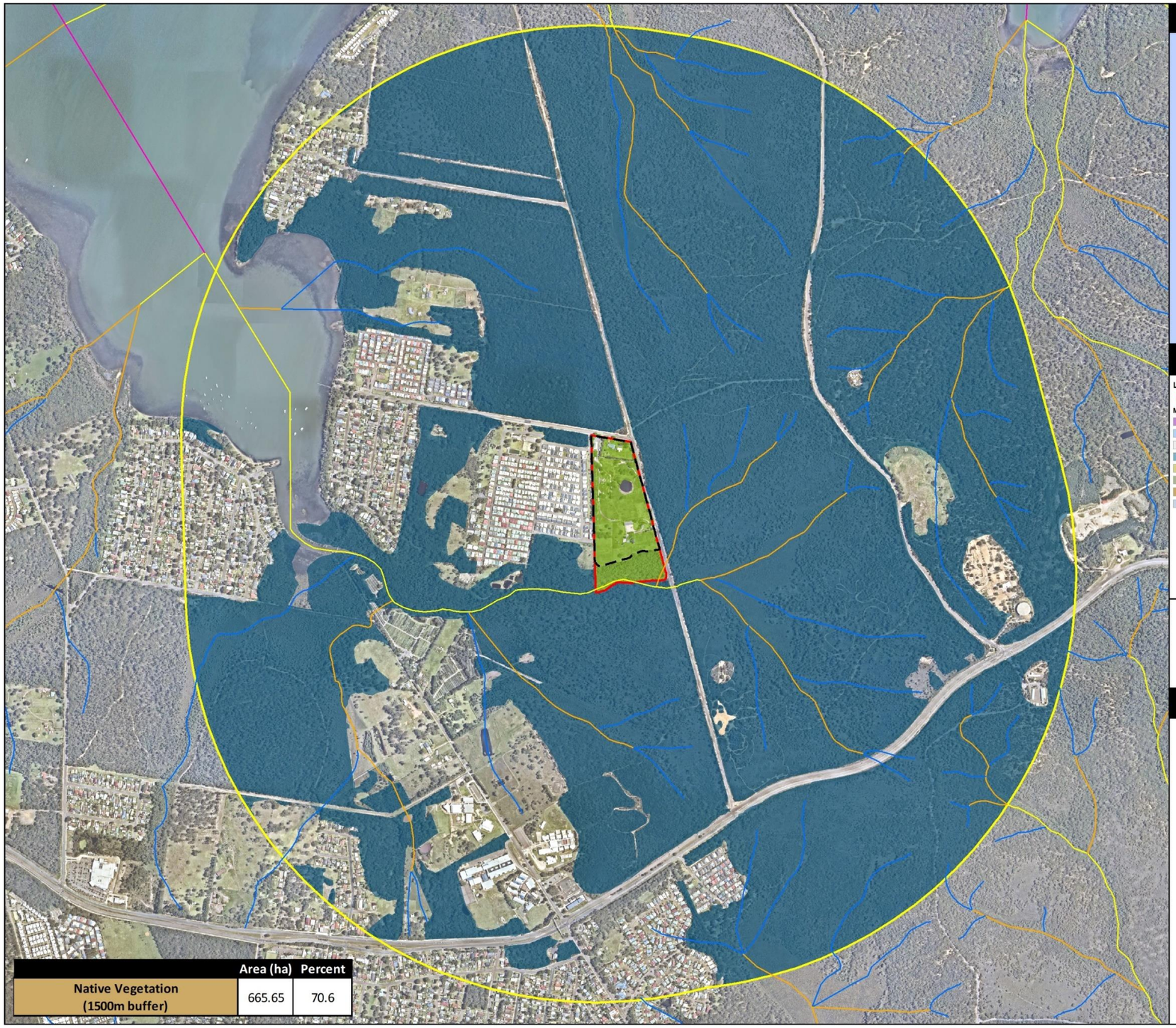
The *CM Act* establishes management objectives specific to each of these management areas, reflecting their different values to coastal communities.

1.4.6 Licences

Individual staff members of *Travers bushfire & ecology* are licensed under Clause 20 of the *National Parks and Wildlife (Land Management) Regulation 1995* and Sections 120 & 131 of the *National Parks and Wildlife Act 1974* to conduct flora and fauna surveys within service and non-service areas. NPWS Scientific Licence Number: SL100848.

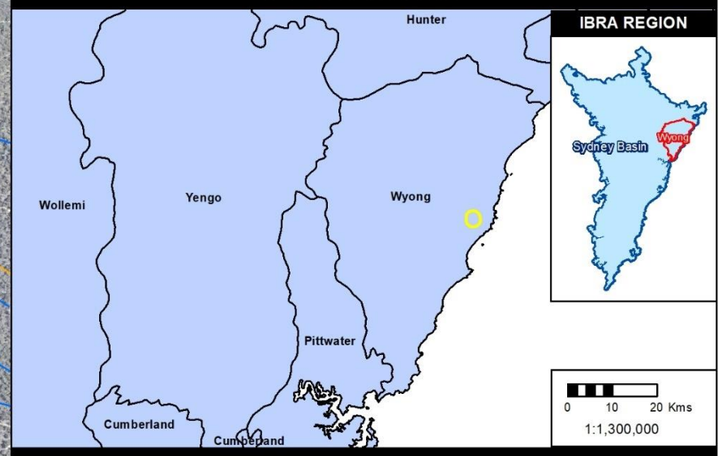
Travers bushfire & ecology staff are licensed under an Animal Research Authority issued by the NSW Department of Primary Industries. This authority allows *Travers bushfire & ecology* staff to conduct various fauna surveys of native and introduced fauna for the purposes of environmental consulting throughout New South Wales.

Figure 1.8 – Site map

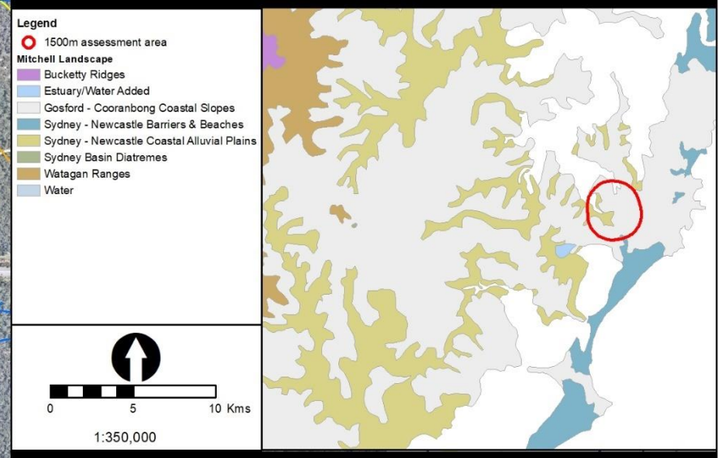


	Area (ha)	Percent
Native Vegetation (1500m buffer)	665.65	70.6

IBRA SUBREGIONS



MITCHELL LANDSCAPE MAPPING



HABITAT CORRIDORS AND CONNECTIVITY

Legend

- Lot boundary (source: LPI)
- Biodiversity Certification area
- 1500m Buffer (942.79ha)
- Verified native vegetation within site boundary - 9.69ha *(Travers bushfire & ecology, 2020)*
- Native vegetation within 1500m buffer (outside study area)(655.96ha)

Stream Order (source:LPI)

- First order
- Second order
- Third order
- Fourth order

Habitat Corridors & Connectivity

- Corridors

Connectivity

- Primary
- Secondary

Aerial source: Nearmap

0 200 400 m

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
45 Mulloway Rd, Chain Valley Bay 18CP02_BAM002	30/07/2021 Issue 1 SC	1:15,000 @A3 GDA 1994 MGA Zone 56

TITLE

Location Map

Document Path: N:\GIS STORAGE\N Drive\18CP02_45_MullowayRd_ChainValleyBay\MXDs\18CP02_BAM002.mxd

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A TBE ENVIRONMENTAL COMPANY

Figure 1.9 – Location map

Figure 1.10 – Patch size

Survey Methodology 2

2.1 Presurvey information collation & resources

Documents reviewed:

- Original concept masterplan prepared by *Vivacity* (date not provided)
- Updated and current masterplan prepared by *Space Design Architecture, 27/07/2021*
- Letter to Central Coast Council re: Planning Proposal – 45 Mulloway Road, Chain Valley Bay *Coastplan Consulting* (30 November 2020)
- Letter to Central Coast Council re. Proposal for manufactured home estate at 45 Mulloway Road, Chain Valley Bay (Lot 5 DP 1228880) from *Biodiversity and Conservation Division* (15 October 2020)
- Bushfire Review prepared by *Coastplan Consulting* (date not provided)
- Planning Proposal to amend Wyong Local Environmental Plan 2013 prepared by *Gavin Maberly-Smith* (July 2019)
- Biodiversity Constraints Assessment Report prepared by *Travers bushfire & ecology* (Sept 2019)
- Preliminary Offset Calculations prepared by *Travers bushfire & ecology* (Feb 2019)

Technical resources utilised:

Legislation

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*)
- *Biodiversity Conservation Act 2016* (*BC Act*)
- *Biodiversity Conservation Regulation 2017* (*BC Reg.*)
- *Fisheries Management Act 1994* (*FM Act*)

Survey guidelines

- *Matters of National Environmental Significance* (Commonwealth of Australia 2013)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities 2004* (working draft), Department of Environment and Conservation (DEC)
- *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians* (DECC – April 2009a)
- *Hygiene Protocol for the Control of Diseases in Frogs* (DECC 2008)
- *Region based guide to the echolocation calls of Microchiropteran bats* (DEC 2004)
- *Species credit threatened bats and their habitats* (DPIE 2018)
- *Flora and Fauna Survey Guidelines - Version 2.0* (Wyong Shire Council 2014)
- *Flora and Fauna Survey Guidelines Version 4.2* (LMCC 2013)
- *Flora and Fauna Guidelines* (Central Coast Council 2019)
- *Best practice field survey methods for environmental consultants and surveyors when assessing proposed development sites or other activities on sites containing threatened species, populations or ecological communities* (OEH 2004)
- *NSW Guide to Surveying Threatened Plants* (DPIE 2016)
- *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020)

Mapping resources

- Aerial photographs (Google Earth Pro / Spatial Information Exchange / NearMap)
- Topographical maps (scale 1:25,000)
- LiDAR data for contours (Land and Property Information, est. 2015 estimated)
- ESpade – DPIE tool for checking soil types

Threatened species records

- *BioNet* database which holds data from a number of custodians (07/12/20 to 10 km)
- EPBC *Protected Matters Search Tool - DAWE* (2020 to 10 km)

Vegetation mapping/resources

- BioNet Vegetation Classification System
- Lower Hunter Central Coast Regional Environmental Mapping (LHCCREMS 2003)
- The natural vegetation of the Wyong Local Government Area (Bell 2002)
- Revised Vegetation Mapping of Wyong LGA: Stage 1 - West of F3 Freeway (Bell & Driscoll 2008)
- NSW Guide to Surveying Threatened Plants (DPIE 2016)

Previous vegetation mapping:

The natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales (S. A. J. Bell, 2008) defines all remnant vegetation within the study area as Map Unit 31 – Narrabeen Doyalson Coastal Woodland (Figure 2.1).

LHCCREMS (2003) vegetation mapping is shown in Figure 2.2, and does not recognise the thin strip of vegetation along the western boundary, nor the scattered trees surrounded by derived grassland. This mapping identifies the following communities within the study area:

- Coastal Plains Smooth-barked Apple Woodland
- Swamp Mahogany - Paperbark Forest
- Riparian Melaleuca Swamp Woodland

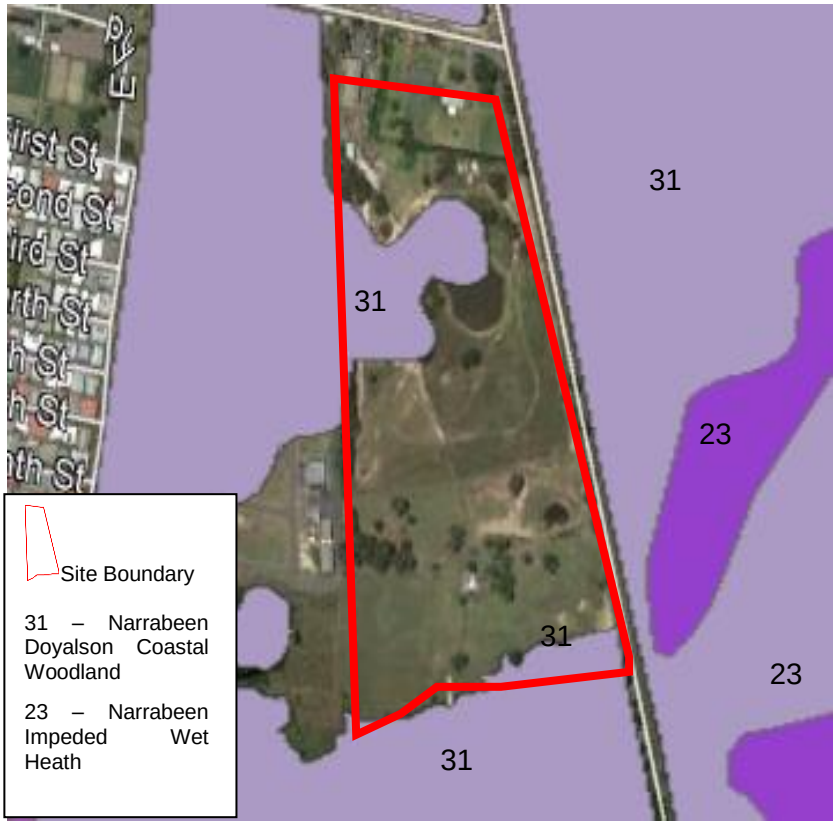


Figure 2.1 – The natural vegetation of the Wyong Local Government Area (Bell & Driscoll 2008)

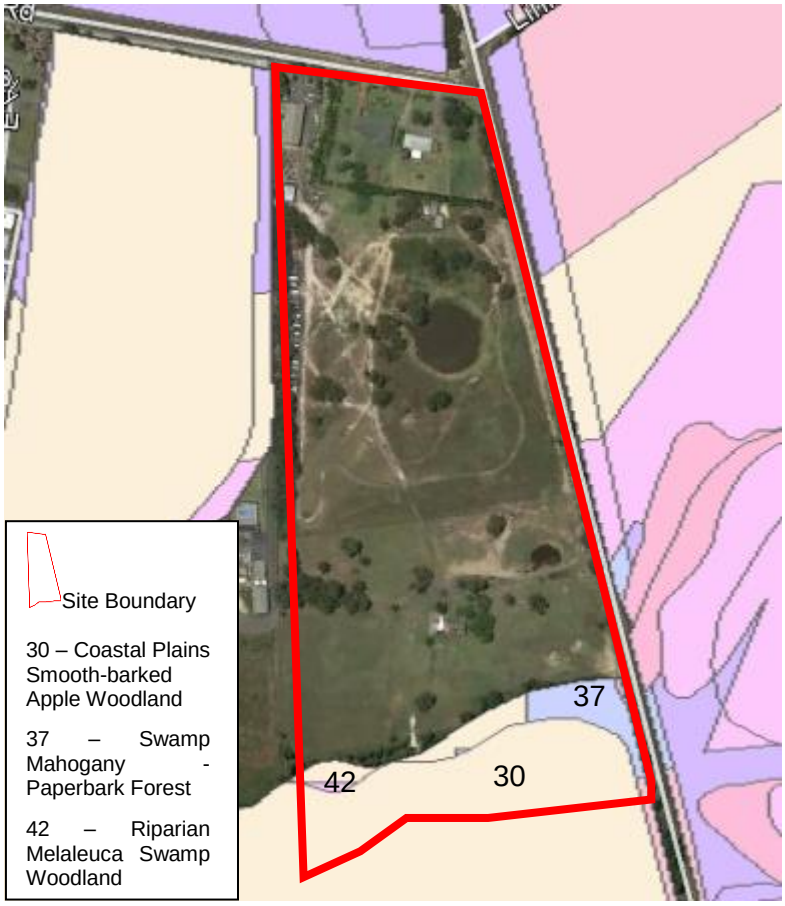


Figure 2.2 – LHCCREMS (2003) vegetation mapping

2.2 Flora survey methodology

2018

A field inspection was previously undertaken on 24 November 2018 for constraints assessment purposes over the time frame of approximately 4hrs. This field inspection was undertaken within the study area primarily to confirm the PCTs, and to determine the ecological and habitat value of the site.

Two (2) 20 x 20 m flora quadrats were undertaken within the existing native or remnant vegetation of the lot to assist in the identification of any PCT present.

Parallel belt transects 10–40 m apart throughout the subject land were also undertaken to determine the value of native or non-native vegetation and to undertake habitat assessments and threatened species searches across the whole of the site for potential flora and fauna species.

Vegetation boundaries were drawn to the approximate extent of any drip line. Opportunistic threatened flora searches were undertaken during stratified surveys.

2019

Botanical survey was undertaken to collect data for BAM-compliance and credit estimation on 14 February 2019 over a time frame of approximately 7 hrs. This involved survey of vegetation zones using three (3) BAM plots, two (2) of which were of standard 20 m x 20 m / 20 m x 50 m dimensions, whereas one (1) in Zone 1 was of 10 m x 40 m / 10 m x 100 m dimensions due to the narrow shape of this Zone. The following information was collected at each of the plots:

- Native overstorey, mid-storey and ground cover recorded for all observed species and an estimate of stems (20 m x 20 m, 10 m x 40 m).
- Stratum (and layer): stratum and layer in which each species occurs (20 m x 20 m, 10 m x 40 m)
- Growth form: growth form for each recorded species (20 m x 20 m, 10 m x 40 m)
- Species name: scientific name and common name (20 m x 20 m, 10 m x 40 m)
- Percent projected foliage cover of the understorey strata and exotic vegetation (20 m x 20 m, 10 m x 40 m)
- Number of trees with hollows visible from the ground (20 m x 50 m, 10 m x 100 m)
- The total length of fallen logs >10 cm in diameter (20 m x 50 m, 10 m x 100 m)
- The proportion of regenerating overstorey species (20 m x 50 m, 10 m x 100 m)
- Number of large trees (20 m x 50 m, 10 m x 100 m)
- Estimates of leaf litter cover, bare ground, cryptograms and rocks in 1 m x 1 m subplots at five (5) locations along the central transect (20 m x 50 m, 10 m x 100 m)

Survey at this time also included some opportunistic survey for *Cryptostylis hunteriana* (may continue flowering to February but usually early summer), *Corunastylis* sp. Charmhaven (flowers Feb-Mar) and *Acacia bynoeana.* Survey was conducted over remnant patches in the proposed development area, but restricted in the riparian area in the southern portion of the study area.

Further, targeted survey for threatened flora was undertaken on 23 September (5 hrs), 24 September (4 hrs) and 27 November (3 hrs), particularly focussing on cryptic species (*Tetratheca juncea*, *Cryptostylis hunteriana*) and *Acacia bynoeana*, using parallel belt transects 5 m apart within Zones 1 & 2, and 10 – 40 m apart within Zone 3.

2020

Targeted survey for threatened flora was undertaken on 10 March 2020, focussing on *Corunastylis* sp. Charmhaven (3 hrs), using belt transects 5 m apart and generally restricted to Zones 1 & 2. Three (3) additional BAM plots were undertaken on 10 December 2020 within the derived grassland (Zone 3).

All plot sheets utilised for the BAM calculator are provided in Appendix 3.

2.3 Fauna survey methodology

2019

Fauna diurnal survey was undertaken on the 26/6/19. Diurnal fauna survey included:

- 3x bird census points (out to a radius of 30–50 m for 30 minutes),
- Opportunistic bird call and activity survey between census points,
- Mammal activity searches (scats, scratches, diggings, burrows, etc.)
- Habitat tree survey within the development footprint,
- Searches of significant habitat trees within the retained vegetation to the south

Significant habitat trees are defined as trees containing large hollows suitable for owls/cockatoos and/or two or more good quality medium hollows and/or several small hollows and/or a tree showing notable use by a threatened species (eg. sap feed tree, raptor nest tree, microbat roost, etc.).

Nocturnal fauna survey was undertaken on 27/6/19, and included:

- Stag-watching of habitat trees HT8 & HT12 during and following the dusk period,
- Spotlighting,
- Frog call identification,
- Ultrasonic microbat recording (x1 passive recording stations),
- Owl calling (Masked Owl)

Significant habitat trees containing large hollows were located in the natural vegetated areas in the southern study area. This cluster was considered ideal for Masked Owl, therefore an attempt was made to call this species in by call mimicry. The species quickly responded to this by flying in close suggesting a diurnal roost was close by at this time. This prompted a closer consideration of use by the species of large hollows present.

2020

A targeted nocturnal survey for Mahony's Toadlet and Wallum Froglet was undertaken on 10/12/20. A more general nocturnal survey was conducted on 15/12/20, and included:

- Stag-watching of habitat trees HT1, HT2, HT3, HT4 & HT5 during and following the dusk period,
- Spotlighting and frog call identification for Mahony's Toadlet and Wallum Froglet
- Ultrasonic microbat recording (x2 passive recording stations),
- Call-playback for Powerful Owl, Barking Owl, Australasian Bittern, Squirrel Glider, Yellow Bellied Glider and Koala

Both of these surveys were preceded by a targeted search for Mahony's Toadlet and Wallum Froglet at a known occurrence site at Norah Head, NSW. This involved both call detection and

active surveillance to ensure conditions were optimal for Mahony's Toadlet. In between these two (2) sessions, an identical survey was conducted along the creek at the southern edge of the site for one (1) hour. In the weeks leading up to the nocturnal survey on the 15/12/20, there had been cycles of rainfall, with 20 mm falling within the 24hr period prior to survey. The afternoon and night of survey was subject to light drizzle and was consistently warm (~22°C) and was therefore considered adequate for summer frog survey including aural-visual surveys for Green and Golden Bell Frog. These surveys were undertaken as prompted by DPIE with consideration for Mahony's Toadlet and Wallum Froglet, however, the habitats present on site are considered non-typical for Mahony's Toadlet and Green and Golden Bell Frog.

Call detection was aided through the use of call playbacks, while active surveillance involved spotlighting along the creek and adjacent vegetation.

Amphibian survey was undertaken in accordance with the *Hygiene Protocol for the Control of Diseases in Frogs* (DECC 2008).

Specific survey effort locations and results are shown on Figure 2.3. All fauna species recorded during survey within the subject land and nearby surrounds are listed in Table 3.6.

A review of the Atlas of NSW Wildlife (DPIE 2019, 2020) was undertaken prior to the site visit to determine threatened species previously recorded within 10 km of the subject land.

Site survey effort accounting for techniques deployed, duration, and weather conditions are outlined in Table 2.1 and are depicted on Figure 2.3.

2.4 Hollow-bearing trees

Hollow-bearing trees were identified and recorded within the development footprint on a *Trimble* handheld GPS unit during 2019 surveys. All data such as hollow types, hollow size, tree species, diameter at breast height, canopy spread and overall height were collected and a metal tag with the tree number placed on the trunk for field relocation purposes. Other habitat features such as nests and significant sized mistletoe for foraging were also noted.

2.5 Field survey effort

Table 2.1 – Fauna survey effort

Fauna group	Date	Weather conditions	Survey technique(s)	Time effort (24hr)
Diurnal birds	26/06/19	4/8 cloud, slight SE wind, rain previous days, temp 17-19°C	Diurnal opportunistic	5hrs, 1100 – 1600
	23/08/19	0/8 cloud, slight W wind, no rain, temp 12-18°C	Diurnal opportunistic	4.5hrs, 0800 – 1230
	11/12/20	8/8 cloud, no wind, no rain, 23°C	Diurnal opportunistic	1.5hrs, 0930 – 1100
Nocturnal birds	27/06/19	0/8 cloud, no wind, no rain, no moon, temp 16-14°C	Call mimicry (Masked Owl), spotlighting	2.33hrs, 1700 – 1920
	15/12/20	8/8 cloud, wind 3-9 km/h, 20 mm rain, 22°C	Call playback (Section 2.5 species)	20 mins, 20:00 – 20:20
Arboreal mammals	26/06/19	4/8 cloud, slight SE wind, rain previous days, temp 17-19°C	Diurnal opportunistic	5hrs, 1100-1600
	27/06/19	0/8 cloud, no wind, no rain, temp 14°C	Spotlighting	2.33hrs, 1700 – 1920
	23/08/19	0/8 cloud, slight W wind, no rain, temp 12-18°C	Diurnal opportunistic	4.5hrs, 0800 – 1230
	11/12/20	8/8 cloud, no wind, no rain, 23°C	Koala SAT x 2	1.5hrs, 09:30 – 11:00
	15/12/20	8/8 cloud, wind 3-9 km/h, 20 mm rain, 22°C	Stag Watching and Spotlighting	20min, 19:40 – 20:00
	15/12/20	8/8 cloud, wind 3-9 km/h, 20 mm rain, 22°C	Call playback (Section 2.5 species)	20mins, 20:00 – 20:20
Terrestrial mammals	26/06/19	4/8 cloud, slight SE wind, rain previous days, temp 17-19°C	Diurnal opportunistic	5hrs, 1100-1600
	27/06/19	0/8 cloud, no wind, no rain, temp 14°C	Spotlighting	2.33hrs, 1700 – 1920
	23/08/19	0/8 cloud, slight W wind, no rain, temp 12-18°C	Diurnal opportunistic	4.5hrs, 0800 – 1230
Bats	26/06/19	0/8 cloud, no wind, no rain, temp 14°C	Ultrasonic recorder x2	Overnight from 1700
	10/12/20	8/8 cloud, wind 17 km/h, no rain, 25°C	Ultrasonic recorder x1	Overnight from 2000
Amphibians	26/06/19	4/8 cloud, slight SE wind, rain previous days, temp 17-19°C	Diurnal opportunistic	5hrs, 1100 – 1600
	27/06/19	0/8 cloud, no wind, no rain, temp 14°C	Spotlighting	2.33hrs, 1700 – 1920
	23/08/19	0/8 cloud, slight W wind, no rain, temp 12-18°C	Diurnal opportunistic	4.5hrs, 0800 – 1230
	10/12/20	8/8 cloud, wind 17 km/h, no rain, 25°C	Target searches / spotlighting (Mahony's Toadlet and Wallum Froglet)	1.5hrs 19:30 - 21:00
	15/12/20	8/8 cloud, wind 3-9 km/h, 20 mm rain, 22°C	Target searches and spotlighting (Mahony's Toadlet and Wallum Froglet)	1.5hrs 20:20 - 21:50

Table 2.2 – Flora survey effort

Flora survey	Survey technique(s)	Dates
Vegetation communities	- Survey of the boundaries of all communities – field verification, delimiting vegetation boundaries	24 Nov 2018 14 Feb 2019 10 Dec 2020
Stratified sampling	- Two (2) 20 m x 20 m flora plots for vegetation community identification. - Five (5) 20 m x 20 m / 50 m x 20 m floristic transect plots and one (1) 10 m x 40 m / 10 m x 100 m within native vegetation using BAM	24 Nov 2018 14 February 2019
Targeted searches	- Targeted searches in known or potential habitats using parallel field traverses for: - *Acacia bynoeana, Angophora inopina, Callistemon linearifolius, Corunastylis* sp. Charmhaven, *Eucalyptus camfieldii , Eucalyptus parramattensis* subsp. *decadens, Eucalyptus parramattensis* subsp. *parramattensis, Genoplesium insigne, Grevillea parviflora* subsp. *parviflora, Rutidosis heterogama, Tetratheca juncea* - *Cryptostylis hunteriana, Genoplesium insigne.* - *Acacia bynoeana, Angophora inopina, Callistemon linearifolius, Corunastylis* sp. Charmhaven, *Eucalyptus camfieldii, Eucalyptus parramattensis* subsp. *decadens, Eucalyptus parramattensis* subsp. *parramattensis, Rutidosis heterogama.*	23–24 Sept 2019 27 Nov 2019 10 Mar 2020

Table 2.3 – Plot and transect survey effort – development footprint

Veg zone no.	PCT	Condition	Area (ha)	Minimum plots required	Plot sampled	Plot identifier	Plot size	Easting at 0 m	Northing at 0 m	Bearing
1	1636	good	0.45	1	1	BAM 1	10 m x 50 m	367490	6328337	179
2	1636	poor	0.72	1	1	BAM 2	20 m x 50 m	367561	6328330	21
-	1718	good	0.08	0	1	BAM 3	20 m x 50 m	367603	6328046	83
3	grassland	derived	5.95	3	3	BAM 4 BAM 5 BAM 6	20 m x 50 m	367540 367619 367544	6328277 6328288 6328087	173 76 317

2.6 Survey limitations

It is important to note that field survey data collected during the survey period is representative of species occurring within the development footprint for that occasion. Due to effects of fire, breeding cycles, migratory patterns, camouflage, weather conditions, time of day, visibility, predatory and / or feeding patterns, increased species frequency or richness may be observed within the development footprint outside the nominated survey period. Habitat assessments based on the identification of micro-habitat features for various species of interest, including regionally significant and threatened species, have been used to minimise the implications of this survey limitation.

2.6.1 Flora survey limitations

The species list does not include all household or exotic garden / landscaping species and those species which could not be identified at the time of the survey past genus level. Cryptic species not flowering at the time of the survey may not be observed during survey outside of peak flowering periods. Likewise cryptic orchid species are generally only recognisable when flowering.

Targeted survey for threatened flora species is compliant with BAM requirements for Vegetation Zones 1 and 2, except for *Diuris praecox,* which must be surveyed for in August for BAM compliance, although the survey period identified by Jones (1993) and Murray *et al.* (2002) is July to early September. *Diuris praecox* grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. This species has low potential to occur and cannot be excluded as a candidate species based on habitat features. It occurs as subterranean tubers most of the year, only producing leaves and flowering stems in winter, and is therefore only identifiable during the brief flowering period.

Threatened flora survey was conducted in March, late September and November, which is unfortunately outside of the flowering period for this species, even considering the advised period of Jones (1993) and Murray *et al.* (2002), which only extends to early September. Flowering may extend over approximately 40 days, and peak flowering is approximately 20 days from the onset of flowering, with 83% of all plants in flower at that time (Yare *et al.* 2019). If this species starts flowering in late July, it is not likely to be flowering and detectable in mid-late September, when our surveys were undertaken. In this instance, we must assume presence of this species for the purposes of this BCAR and credit calculations. Additional survey for *D. praecox* in August would enable conformation of presence or absence of this species, depending on the results of such survey, and this may alter the credit requirements of the proposal.

Table 2.4 – Survey adequacy for species credit species (flora)

Common name	*BC Act*	Potential to occur (presence status) / Habitat	Preferred survey period (DPIE)	Actual survey period	Survey sufficient to rule out presence
Acacia bynoeana	E1	unlikely	Sept–March	March, Sept, Nov	Yes
Angophora inopina	V	moderate	All months	March, Sept, Nov	Yes
Astrotricha crassifolia	V	unlikely	July–Dec	Sept, Nov	Yes
Callistemon linearifolius	V	low	Sept–March	March, Sept, Nov	Yes
Corunastylis sp. Charmhaven	E4A	low - Zones 1 & 2 no - Zone 3 (habitat degraded)	Nov–April	March, Nov	Yes
Cryptostylis hunteriana	V	low - Zones 1 & 2 no - Zone 3 (habitat degraded)	Nov–Jan	Nov	Yes
Diuris praecox	V	low - Zones 1 & 2 no - Zone 3 (habitat degraded)	Aug	March, Sept, Nov	No
Eucalyptus camfieldii	V	low	All months	March, Sept, Nov	Yes
Genoplesium insigne	E1	moderate - Zones 1 & 2 no - Zone 3 (habitat degraded	Sept–Nov	Sept, Nov	Yes
Grevillea parviflora subsp. *parviflora*	V	moderate	Aug–Oct	Sept	Yes
Rutidosis heterogama	V	unlikely - Zones 1 & 2 no - Zone 3 (habitat degraded)	All months	March, Sept, Nov	Yes
Tetratheca glandulosa	V	moderate - Zones 1 & 2 no - Zone 3 (habitat degraded)	Sept–Oct	Sept	Yes
Tetratheca juncea	V	moderate - Zones 1 & 2 no - Zone 3 (habitat degraded)	Sept–Oct	Sept	Yes

2.6.2 Fauna survey limitations

With respect to fauna species credit species Table 2.5 shows; 1) species that don't require survey due to absence of breeding habitat within the subject lands, 2) species that don't require survey as there is no potential habitat or otherwise any considered potential to occur, 3) species considered as vagrant, and 4) otherwise, species that have been adequately surveyed for presence. Of the remaining species and those not recorded to date, survey is not sufficient to rule out presence for Squirrel Glider and Eastern Pygmy Possum due to no trapping effort undertaken. Survey was undertaken for Masked Owl and Southern Myotis and both species credit habitats were recorded present. Survey is not required for Swift Parrot as the species is to be assumed present based on Important Habitat Area Mapping.

Table 2.5 – Survey adequacy for species credit species (fauna)

Common name	*BC Act*	Potential to occur (presence status) / Habitat	Breeding habitat absent	Survey adequacy		
				Preferred survey period (TBDC)	Actual Survey period	Survey sufficient to rule out presence
Large Bent-winged Bat (breeding)	V	Yes (recorded)	✓			
Little Bent-winged Bat (breeding)	V	Yes (recorded)	✓			
Masked Owl (breeding)	V	Yes (recorded)	x	May-Aug	May	x
Southern Myotis	V	Yes (recorded)	n/a	Oct-Mar	May / Dec	x
Glossy Black-Cockatoo (breeding)	V	Yes	✓			
Grey-headed Flying-fox (breeding)	V	Yes	✓			
Powerful Owl (breeding)	V	Yes	✓			
Square-tailed Kite (breeding)	V	Yes	✓			
Squirrel Glider	V	Yes	n/a	All	May / Dec	x
Swift Parrot (breeding)	E	Yes	mapped	n/a	n/a	x
Wallum Froglet	V	Yes	n/a	All	May / Dec	✓
White-bellied Sea Eagle (breeding)	V	Yes	✓			
Regent Honeyeater (breeding)	E4A	Yes (low)	✓			
Barking Owl (breeding)	V	Yes (unlikely)	✓			
Bush Stone-curlew	E	Yes (unlikely)	n/a	All	May / Dec	✓
Eastern Pygmy Possum	V	Yes (unlikely)	n/a	Oct-Mar	May / Dec	x
Koala (breeding)	V	Yes (unlikely)	x	All	May / Dec	✓
Little Eagle (breeding)	V	Yes (unlikely)	✓			
Osprey (breeding)	V	Yes (unlikely)	✓			
Pale-headed Snake	V	Yes (unlikely)	n/a	Nov-Mar	Dec	✓
Green and Golden Bell Frog	E	No (not likely)	n/a	Nov-Mar	Dec	✓
Gang-gang Cockatoo (breeding)	V	No (not likely)	✓	Oct-Jan	Dec	✓
Mahony's Toadlet	E	No (not likely)	n/a	Oct-Mar	Dec	✓

Hollows within habitat trees HT4, HT11, HT14 and HT15 have not been stag-watched during surveys to date.

2.7 Accuracy of identification

Structural descriptions of the vegetation were made according to Specht *et al* (1995).

PCT	Impacted area (HA)
Zone 1: PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast (good)"	0.45
Zone 2: PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast (poor)"	0.72
Zone 3: Derived Grassland	5.95
TOTAL	**7.12**

Figure 2.3 – Flora and fauna survey effort and results

Survey Results 3

3.1 Flora results

3.1.1 Native vegetation extent

Within the study area native vegetation occurs as scattered remnant trees within large areas of pastoral land or as large contiguous polygons along the western and southern boundaries of the lot. There are also areas of household gardens surrounding the large shed and northern and central dwellings.

The vegetation in the locality and within the whole of the study area has been mapped within *The natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales* (S. A. J. Bell, 2008) as Map Unit 31 – Narrabeen Doyalson Coastal Woodland.

3.1.2 Flora species

The plants observed within the vegetation communities of the study area are listed in the Table 3.1 below.

Table 3.1 – Flora observations within the study area

Family	Scientific name	Common name
TREES		
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany
Phyllanthaceae	*Glochidion ferdinandi* var. *ferdinandi*	Cheese Tree
Myrtaceae	*Melaleuca decora*	-
Meliaceae	*Melia azedarach*	White Cedar
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
SHRUBS		
Fabaceae	*Acacia longifolia* var. *longifolia*	Sydney Golden Wattle
Fabaceae	*Acacia myrtifolia*	Red Stem Wattle
Fabaceae	*Acacia suaveolens*	Sweet Scented Wattle
Fabaceae	*Acacia ulicifolia*	Prickly Moses
Myrtaceae	*Baeckea diosmifolia*	Fringed Baeckea
Proteaceae	*Banksia marginata*	Silver Banksia
Proteaceae	*Banksia oblongifolia*	Fern-leaf Banksia
Fabaceae	*Bossiaea heterophylla*	Variable Bossiaea
Asteraceae	*Chrysanthemoides monilifera* subsp. *rotundata**	Bitou Bush
Fabaceae	*Dillwynia retorta*	Eggs and Bacon

Family	Scientific name	Common name
Epacridaceae	*Epacris pulchella*	Wallum Heath
Fabaceae	*Gompholobium glabratum*	Dainty Wedge-pea
Proteaceae	*Grevillea sericea*	Pink Spider Flower
Proteaceae	*Hakea dactyloides*	Broad-leaved Hakea
Proteaceae	*Isopogon anethifolius*	Round-leaved Drumsticks
Myrtaceae	*Kunzea ambigua*	Tick Bush
Proteaceae	*Lambertia formosa*	Mountain Devil
Myrtaceae	*Leptospermum trinervium*	Slender Tea-tree
Myrtaceae	*Melaleuca sieberi*	-
Fabaceae	*Mirbelia speciosa*	-
Proteaceae	*Persoonia levis*	Broad-leaved Geebung
Proteaceae	*Petrophile pulchella*	Conesticks
Apiaceae	*Platysace linearifolia*	Narrow-leafed Platysace
Fabaceae	*Pultenaea daphnoides*	Large-leaf Bush Pea
Fabaceae	*Pultenaea linophylla*	-
Fabaceae	*Pultenaea villosa*	Hairy Bush-pea
Rosaceae	*Rubus fruticosus* sp. agg.*	Blackberry complex
GROUNDCOVERS		
Asteraceae	*Actinotus minor*	Lesser Flannel Flower
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair
Poaceae	*Anisopogon avenaceus*	Oat Speargrass
Poaceae	*Austrostipa pubescens*	Tall Speargrass
Poaceae	*Axonopus fissifolius**	Narrow-leaved Carpet Grass
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Poaceae	*Briza maxima*	-
Poaceae	*Briza minor*	-
Poaceae	*Briza subaristata**	-
Anthericaceae	*Caesia parviflora* var. *parviflora*	Pale Grass Lily
Poaceae	*Cenchrus clandestinum**	Kikuyu, Kikuyu Grass
Apiaceae	*Centella asiatica*	Swamp Pennywort
Asteraceae	*Conyza sumatrensis**	Tall Fleabane
Asteraceae	*Coreopsis lanceolata**	Coreopsis
Poaceae	*Cortaderia selloana**	Pampas Grass
Orchidaceae	*Cryptostylis subulata*	Large Tongue Orchid
Cyperaceae	*Cyathochaeta diandra*	-
Poaceae	*Cynodon dactylon*	Common Couch
Cyperaceae	*Cyperus eragrostis**	Umbrella Sedge
Phormiaceae	*Dianella caerulea* var. *caerulea*	Flax Lily
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass
Poaceae	*Echinopogon caespitosus* var. *caespitosus*	Tufted Hedgehog Grass
Restionaceae	*Empodisma minus*	-
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Eragrostis brownii*	Brown's Lovegrass
Cyperaceae	*Fimbristylis dichotoma*	-
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Asteraceae	*Gamochaeta calviceps**	Cudweed
Haloragaceae	*Gonocarpus micranthus* subsp. *micranthus*	Creeping Raspwort
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort

Family	Scientific name	Common name
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Goodeniaceae	*Goodenia heterophylla* subsp. *heterophylla*	Variable Leaved Goodenia
Haemodoraceae	*Haemodorum planifolium*	Bloodroot
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
Apiaceae	*Hydrocotyle laxiflora*	-
Apiaceae	*Hydrocotyle sibthorpioides*	Pennywort
Poaceae	*Hyparrhenia hirta**	Coolatai Grass
Clusiaceae	*Hypericum* sp.*	
Asteraceae	*Hypochaeris radicata**	Flatweed
Poaceae	*Imperata cylindrica*	Blady Grass
Juncaceae	*Juncus usitatus*	Common Rush
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Restionaceae	*Lepyrodia scariosa*	Scale Rush
Lindsaeaceae	*Lindsaea linearis*	Screw Fern
Lomandraceae	*Lomandra cylindrica*	-
Lomandraceae	*Lomandra glauca*	Pale Mat-rush
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Lomandraceae	*Lomandra multiflora* subsp. *multiflora*	Many-flowered Mat-rush
Lomandraceae	*Lomandra obliqua*	Twisted Mat-rush
Poaceae	*Microlaena stipoides*	Weeping Grass
Myrtaceae	*Micromyrtus* sp.	-
Poaceae	*Panicum simile*	Two Colour Panic
Poaceae	*Paspalidium distans*	-
Poaceae	*Paspalum dilatatum*	Paspalum
Poaceae	*Paspalum urvillei**	Vasey Grass
Iridaceae	*Patersonia sericea*	Wild Iris
Thymelaeaceae	*Pimelea linifolia* subsp. *linifolia*	Slender Rice Flower
Plantaginaceae	*Plantago lanceolata**	Ribwort
Lobeliaceae	*Pratia purpurascens (Lobelia purpurascens)*	Whiteroot
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Ranunculaceae	*Ranunculus* sp.	
Rubiaceae	*Richardia stellaris**	
Goodeniaceae	*Scaevola ramosissima*	Purple Fan Flower
Selaginallaceae	*Selaginella uliginosa*	Swamp Selaginella
Asteraceae	*Senecio madagascariensis**	Fireweed
Poaceae	*Setaria parviflora**	Slender Pigeon Grass
Gentianaceae	*Schenkia australis*	Spike Centaury
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Solanaceae	*Solanum nigrum**	Black-berry Nightshade
Poaceae	*Sporobolus elongatus*	Slender Rat's Tail Grass
Stackhousiae	*Stackhousia nuda*	-
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Stylidiaceae	*Stylidium lineare*	Narrow-leaved Trigger Plant
Asteraceae	*Taraxacum officinale**	Dandelion
Poaceae	*Themeda triandra*	Kangaroo Grass
Anthericaceae	*Thysanotus tuberosus*	Fringed Lily
Apiaceae	*Trachymene incisa* subsp. *incisa*	Native Parsnip
Verbenaceae	*Verbena bonariensis**	Purpletop

Family	Scientific name	Common name
Menyanthaceae	*Villarsia exaltata*	Yellow Marsh Flower
Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell
Iridaceae	*Watsonia meriana**	Watsonia
Xanthorrhoaceae	*Xanthorrhoea media*	Forest Grass Tree
VINES		
Lauraceae	*Cassytha glabella*	Slender Devil's Twine
Fabaceae	*Glycine clandestina*	Twining Glycine
Fabaceae	*Hardenbergia violacea*	False Sarsparilla
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower
Apocynaceae	*Parsonsia straminea*	Silk Pod
* denotes exotic species TS denotes threatened species		

3.1.3 Plant community types (PCTs)

Evidence used to identify a PCT

Identification of the PCTs within the site was done using the online BioNet Vegetation Classification Tool (BVCT). Plot data was entered into the BVCT to produce a shortlist of potential PCTs. Interim Biogeographic Regionalisation for Australia (IBRA) sub-region (Wyong), and vegetation formation and class information were also utilised. The top five shortlisted PCTs for each plot are provided in Table 3.2, which includes the number of diagnostic species present for each shortlisted PCT in each plot. From the shortlist, final PCTs were then chosen based on diagnostic species presence and abundance, and similarity to descriptive attributes and distributional information provided in the BVCT. Justification for inclusion or exclusion of each shortlisted PCT is provided in Table 3.2.

Table 3.3 provides a summary of the PCT occurring within the development site, including vegetation formation, percent cleared within and extent within the development site.

All plot sheets utilised for the BAM calculator are in Appendix 3.

Table 3.2 – PCT shortlist and justification

Zone	Shortlisted PCTs	PCT name	Number of diagnostic species matches (BVCT)		Match	Justification
			Q1	Q3		
1 & 2	1083	Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	14	-	*x*	Wrong landscape position: Occurs on crests, ridges and exposed slopes on coastal sandstone plateaux.
	1642	Scribbly Gum - Red Bloodwood - Old Man Banksia heathy woodland of southern Central Coast	11	-	*x*	Wrong landscape position: Dissected Sandstone Hills of the southern Central Coast hinterlands. The mid-stratum is not "characterised by tall *Banksia* and *Leptospermum* shrubs".
	1643	Red Bloodwood - Smooth-barked Apple - Scribbly Gum - Old Man Banksia heathy woodland on sandstone ranges of the Central Coast	11	-	*x*	Wrong landscape position: "sandstone ranges".
	1786	Sydney ironstone Bloodwood-Silvertop Ash forest	11	-	*x*	Wrong landscape position: "steep sandstone slopes that overlook the Hawkesbury River and its tributaries"
	1636	**Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast**	**10**	**-**	✓	**Correct landscape position: "coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie", presence of upper strata dominants and most diagnostic understorey species.**
	1783	Sydney North exposed sandstone woodland	10	-		
n/a	**1718**	**Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast**	**-**	**9**	✓	**Most diagnostic species present. Correct landscape position: "poorly drained unconsolidated sediments of the coastal lowlands| elevations are typically under 50m"**

Zone	Shortlisted PCTs	PCT name	Number of diagnostic species matches (BVCT)		Match	Justification
			Q1	Q3		
	1716	Prickly-leaved Paperbark forest on coastal lowlands of the Central Coast and Lower North Coast	-	8	*x*	Correct landscape position: unconsolidated sediments or on fine-grained sedimentary geologies at elevations up to 100m. Floristically not a close match – diagnostic *E. resinifera, Melaleuca nodosa* and grassy ground layer are absent.
	1719	Paperbarks - Woollybutt swamp forest on coastal lowlands of the Central Coast	-	8	*x*	Wrong location: "low-lying land to the west of both Doyalson and Warnervale" – site is east of Doyalson. Floristically not a close match – diagnostic *E. longifolia* absent; *Gahnia* (dominant on site) is not listed as diagnostic.
	1717	Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	-	7	*x*	High number of diagnostic species including canopy diagnostic *Melaleuca quinquenervia & E. robusta,* midstorey diagnostics *Melaleuca linariifolia & Glochidion ferdinandi.* Correct landscape position: coastal floodplains and poorly drained lowlands. Study site is outside of stated distribution.
	1721	Swamp Mahogany - Broad-leaved Paperbark - Saw Sedge - Yellow Marsh Flower swamp forest of coastal lowlands	-	7	*x*	This PCT is a close match floristically, with many diagnostic species present, but the vegetation description of "Myrtaceous Swamp Open Forests with areas of open water" does not apply - while there are small pools after heavy rain, it contains no open water.

Zones 1 & 2:

The identification of the most suitable PCT was based upon filtering for IBRA subregion (Wyong), vegetation class (Sydney Coastal Dry Sclerophyll Forests) and all native species within plot 1, using the BVCT. Plot 1 within Zone 1 was used for PCT identification for both Zones 1 and 2 as it is less disturbed and contains a greater species richness in all strata. The top five filtered PCTs are provided in Table 3.2 (In this case PCTs 1636 and 1783 were ranked equal fifth, hence there are six PCTs in the "top five"). Note that PCT 1636 is equivalent to Narrabeen Doyalson Coastal Woodland mapped by the Wyong LGA mapping (Figure 2.1). PCT 1619, which was selected for similar vegetation at a nearby but non-related site to the west only ranked equal ninth out of all filtered PCTs, and is not included in the shortlist for Zones 1 and 2 (Table 3.2).

PCTs 1083, 1642, 1643, 1786 and 1783 can all be excluded as they occur in different landscape positions and/or in different geology than that present within the subject land - details are provided in Table 3.2. PCT 1636 is a close match floristically, whilst also occurring in the correct landscape position - coastal lowlands from northern Tuggerah Lake to the northern end of Lake Macquarie. Key canopy diagnostics for PCT 1636 are present (*E. haemastoma* and *C. gummifera*), as are most understory species. This PCT is considered the most correct PCT for Zones 1 and 2.

Zone 3:

Zone 3 contains derived grassland dominated by exotic species. Few native species exist, but some are present. As such, we have treated this grassland as native vegetation for the purposes of credit calculation, and assigned it to Zone 3. Given the landscape position, and remnant vegetation on site (Zones 1 & 2), we consider that the previous vegetation prior to clearing would have been commensurate with PCT 1636.

Vegetation to the south of Biodiversity Certification area:

This vegetation community occurs in the southern portion of the study area, outside of the biodiversity certification area. As this vegetation will not be impacted by the proposal, it does not require allocation to a specific Vegetation Zone. This vegetation has elements of both forested wetland and dry sclerophyll vegetation, with forested wetland elements predominating slightly. The identification of the most suitable PCT was based upon filtering for IBRA subregion (Wyong), vegetation class (Coastal Swamp Forests) and all native species within plot 3, using the BVCT. The top five filtered PCTs are provided in Table 3.2. Most of the shortlisted PCTs are similar and potentially match the vegetation in terms of floristic composition. PCT 1716 is not a close match floristically as the diagnostic *E. resinifera, Melaleuca nodosa* and grassy ground layer are absent from the vegetation. PCTs 1717 and 1719 occur outside the locality of the subject land (Table 3.2). For PCT 1721, the vegetation description of "Myrtaceous Swamp Open Forests with areas of open water" does not apply - while there are small pools after heavy rain, it contains no open water. PCT 1718 has the most diagnostic species present, and the vegetation is in the correct landscape position for this PCT: "poorly drained unconsolidated sediments of the coastal lowlands| elevations are typically under 50m". As such, PCT 1718 is considered the most correct PCT for the southern vegetation.

Table 3.3 – PCTs

PCT code	PCT name	Species relied upon	Vegetation formation	Vegetation class	% Cleared	Area within development site (ha)	TEC status
1636	Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	*Corymbia gummifera, Eucalyptus haemastoma, Lambertia formosa, Banksia oblongifolia*	Dry Sclerophyll Forests (Shrubby sub-formation);	Sydney Coastal Dry Sclerophyll Forests;	58	1.17 on site (0.45 good, 0.72 poor), all to be impacted	Not a TEC
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	*Eucalyptus robusta Gahnia clarkei, Pteridium esculentum, Acacia longifolia*	Forested Wetlands;	Coastal Swamp Forests;	74	2.40 on site, none to be impacted	Swamp Sclerophyll Forest

3.1.4 Vegetation descriptions of observed communities

<u>Zones 1 & 2:</u> PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast

This vegetation community describes all non-floodplain, forested vegetation located within the study area. PCT 1636 occurs in two condition states: 0.28 ha is in good condition (Zone 1), with high diversity in all strata, and 0.64 ha is on poor condition (Zone 2), with a disturbed understorey and a largely absent shrub layer.

Canopy

Angophora costata, Eucalyptus haemastoma, Corymbia gummifera and *Eucalyptus capitellata* are the dominant species, 14–22 m tall, with a highly variable projected foliage cover (PFC) between 2 and 40%.

Sub-canopy

Allocasuarina littoralis. Vegetation height to 12 m tall.

Mid-storey

Acacia longifolia, Lambertia formosa, Hakea dactyloides, Banksia oblongifolia and within moister areas, *Melaleuca sieberi*. 1–4 m tall and where present a highly variable PFC of 1–10%. Cover is variable due to the impacts of past and ongoing land uses.

Ground layer

Epacris pulchella, Gonocarpus teucrioides, Pimelea linifolia, *Lomatia silaifolia, Bossiaea heterophylla, Platysace linearifolia, Xanthorrhoea latifolia, Patersonia sericea, Lomandra obliqua, Dianella caerulea, Lindsaea linearis,* and *Actinotus minor*.

Grasses include *Entolasia stricta, Eragrostis brownii, Themeda triandra, Panicum simile, Oplismenus aemulus, Imperata cylindrica* and *Anisopogon avenaceus*.

Classification

PCT 1636 is associated with the Threatened Ecological Community (TEC) known as *Kincumber Scribbly Gum Forest in the Sydney Basin Bioregion (Part)* as listed within the NSW *BC Act* (2016). However, Kincumber Scribbly Gum Forest is restricted to a small area on the Bouddi Peninsula on the NSW Central Coast south of Kincumber. It only occurs in the former Gosford LGA. Therefore the Coastal woodland vegetation within the study area is not commensurate with the *Kincumber Scribbly Gum Forest* TEC. In addition, *Angophora inopina* does not occur in the Kincumber region.

Photo 1 – PCT 1636 (good) within BAM plot 1.

Photo 2 – PCT 1636 (poor) within BAM plot 2

<u>Zone 3:</u> Grassland and gardens

This vegetation occupies most of the remaining site. It occurs mostly as managed pasture dominated by exotic species. Some exotic trees and shrubs occur surrounding the buildings and driveway.

Canopy

Largely absent from the open paddock areas.

Where trees occur, they are various horticultural, ornamental or exotic species including *Morus* sp. (Mulberry), *Callitris* sp., *Jacaranda, Acer, Callistemon viminalis, Lagerstroemia* sp. (Crepe Myrtle), *Liquidambar* and *Prunus* sp. were common species 6–14 m tall and with a variable projected foliage cover of 3-40%.

Mid-storey

Where they occur, *Rubus fruticosus* sp. agg., *Buxus* sp.*, Frangipani* sp.*, Schefflera* sp.*,* various exotic palms, and a suite of fruit trees. Vegetation 3–8 m tall and average PFC of 3–35%.

Ground layer

In the open paddock areas the vegetation dominated by exotic grasses including *Hyparrhenia hirta, Briza* spp., *Axonopus fissifolius, Stenotaphrum secundatum* and *Cenchrus clandestinus* occupying 50–95% PFC. Few native species occur, but include *Centella asiatica, Eragrostis brownii, Schenkia australis, Cynodon dactylon, Themeda triandra* and *Cheilanthes sieberi*, occupying 1–8% PFC.

Nearer the buildings are various exotic garden plants such as *Canna* sp.*, Agapanthus* sp.*, Hedychium gardnerianum*, *Passiflora* sp., and weeds such as *Verbena bonariensis, Conyza sumatrensis, Plantago lanceolata, Taraxacum officinale, Trifolium repens* and *Solanum nigrum.*

The Vegetation Integrity score for Zone 3 is below 17 (Table 3.4), which is the condition threshold for PCTs associated with threatened species habitat (Section 3.1.1.3 of the BAM). As these VI scores are below the threshold, the cleared areas do not require further assessment of vegetation beyond Section 5.4 of the BAM (generating a VI score), and assessment of threatened species habitat according to Section 6.2 and Paragraph 6.2.1.4 of the BAM (Assessment for ecosystem credits) is not required. This vegetation is still required to be assessed for species credit species through the BAM-C.

Photo 3 – Derived grassland within BAM plot 4 in the centre of the site.

Photo 4 – Household gardens near the northern dwelling

Photo 5 – Household gardens and trees to the east of the central dwelling

<u>Vegetation to the south of biodiversity certification area:</u> PCT 1718 Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast

This vegetation community describes the floodplain vegetation in the southern portion of the study area, outside of the biodiversity certification area. As this vegetation will not be impacted by the proposal, it does not require allocation to a specific Vegetation Zone. The vegetation is upon slightly hummocky grounds with small areas of intermittent soaks as well as mounds, thus there is a mixture of species that occur regularly in swamp sclerophyll vegetation as well as others that occur more regularly in drier locations but can tolerate the rare flood event. This vegetation community occupies approximately 2.38 ha within the study area.

Canopy

Eucalyptus robusta, Angophora costata, Eucalyptus capitellata and *Melaleuca quinquenervia* are the dominant species, 12–23 m tall and with a PFC of 20–40%.

Mid-storey

Melaleuca sieberi, Melaleuca linariifolia, Acacia longifolia, Kunzea ambigua, Allocasuarina littoralis. Vegetation 1–12 m tall and average PFC of 15–40%.

Ground layer

Gahnia clarkei, Pteridium esculentum, Centella asiatica, Goodenia heterophylla, Pimelea linifolia, Gonocarpus teucrioides, Pultenaea palacea, Imperata cylindrica, Entolasia stricta and *Panicum simile*.

<u>Classification</u>

PCT 1718 vegetation community corresponds to the Endangered Ecological Community (EEC) *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-east Corner Bioregions* as listed under the NSW *BC Act*.

Photo 6 – PCT 1718 within BAM plot 3.

3.1.5 Vegetation integrity assessment

A vegetation integrity assessment is an assessment on the site's condition. Vegetation patches are broken into zones of roughly equal quality and then surveyed by transect plots. The number of required transect plots is dependent upon the size of the zone.

Vegetation zone area (ha)	Minimum number of plots/transects
<2	1 plot/transect
>2–5	2 plots/transects
>5–20	3 plots /transects
>20–50	4 plots/transects
>50–100	5 plots/transects
>100–250	6 plots/transects
>250–1000	7 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone
>1000	8 plots/transects; more plots may be needed if the condition of the vegetation is variable across the zone

Once data from the transect plot has been collected, the composition of native plant species per growth form is assessed, along with numbers of stems, percentages of exotic or high threat exotic species present, number and sizes of Eucalypt and non-Eucalypt tree stems, litter cover, rock cover, cryptogram cover, hollows and fallen logs. Therefore the vegetation integrity assessment is a measure of composition, structure and function.

The breakdown of PCTs and zones is shown on Figure 2.3. Impacted areas (the development footprint) are shown cross-hatched. Figure 2.3 shows the location of the plots in relation to the impacted areas.

The vegetation integrity score is obtained using equations and weightings based upon a number of entities to calculate scores for composition, structure and function, for an overall current vegetation integrity score.

Table 3.4 – Current vegetation integrity score

Vegetation zone name	Area (ha)	Composition condition score	Structure condition score	Function condition score	Current vegetation integrity score
Zone 1: 1636 Good	0.45	82.6	58.3	55.4	64.4
Zone 2: 1636 Poor	0.72	56.8	51.6	69.3	58.8
Zone 3: Grassland	5.95	5.6	1.1	16	4.7

The future vegetation integrity score is measured assuming there will be no vegetation retained within the development footprint, including proposed lots, internal roads and APZs. Given this, the future vegetation integrity score for all Zones will be 0 as indicated in Table 3.5.

Table 3.5 – Future vegetation integrity score

Vegetation zone name	Area (ha)	Composition condition score	Structure condition score	Function condition score	Future vegetation integrity score
Zone 1: 1636 Good	0.45	0	0	0	0
Zone 2: 1636 Poor	0.72	0	0	0	0
Zone 3: Grassland	5.95	0	0	0	0

3.2 Fauna results

Fauna species observed throughout the duration of fauna surveys are listed below.

Table 3.6 – Fauna recorded within the study area

Common name	Scientific name	Method observed	
Birds		**June 2019**	**Dec 2020**
Australasian Grebe	*Tachybaptus novaehollandiae*	O	
Australian Hobby	*Falco longipennis*	O	
Australian Magpie	*Cracticus tibicen*	O W	
Australian Raven	*Corvus coronoides*	O W	
Australian Wood Duck	*Chenonetta jubata*	O	
Black-faced Monarch	*Monarcha melanopsis*	W[PO]	
Brown Thornbill	*Acanthiza pusilla*	O W	
Channel-billed Cuckoo	*Scythrops novaehollandiae*		W
Crested Pigeon	*Ocyphaps lophotes*	O	
Eastern Rosella	*Platycercus eximius*	O W	O W
Eastern Spinebill	*Acanthorhynchus tenuirostris*	W	
Eastern Yellow Robin	*Eopsaltria australis*	W	
Galah	*Eolophus roseicapillus*	O W	
Grey Fantail	*Rhipidura albiscapa*	O W	
Laughing Kookaburra	*Dacelo novaeguineae*	O W	
Lewin's Honeyeater	*Meliphaga lewinii*	W	
Magpie-lark	*Grallina cyanoleuca*	O W	
Masked Owl [TS]	*Tyto novaehollandiae*	O W	
Musk Lorikeet	*Glossopsitta concinna*	W	
Noisy Miner	*Manorina melanocephala*	O W	
Pied Butcherbird	*Cracticus nigrogularis*	O W	
Rainbow Lorikeet	*Trichoglossus haematodus*	O W	O W
Satin Bowerbird	*Ptilonorhynchus violaceus*	W	
Scaly-breasted Lorikeet	*Trichoglossus chlorolepidotus*	W	
Spotted Pardalote	*Pardalotus punctatus*	W	
Striated Thornbill	*Acanthiza lineata*	O W	
Superb Fairy-wren	*Malurus cyaneus*	O W	
Welcome Swallow	*Hirundo neoxena*	O	
White-throated Treecreeper	*Cormobates leucophaea*	W	
Yellow-faced Honeyeater	*Caligavis chrysops*	W	
Yellow-tailed Black-Cockatoo	*Calyptorhynchus funereus*	W	
Mammals			
Common Brushtail Possum	*Trichosurus vulpecula*	F	
Common Ringtail Possum	*Pseudocheirus peregrinus*	O	
Eastern Coastal Free-tailed Bat [TS]	*Micronomus norfolkensis*	U[PR]	
Large Bent-winged Bat [TS]	*Miniopterus orianae oceanensis*	U	
Eastern Freetail-bat	*Mormopterus ridei*	U	
Gould's Wattled Bat	*Chalinolobus gouldii*	U	U[PR]
Horse *	*Equus caballus*	O	
Large Forest Bat	*Vespadelus darlingtoni*	U[PR]	
Southern Myotis[TS]	*Myotis macropus*	U	
Long-eared Bat	*Nyctophilus sp.*	U[PR]	

Common name	Scientific name	Method observed	
Little Bent-winged Bat [TS]	*Miniopterus australis*	U	
Little Forest Bat	*Vespadelus vulturnus*	U[PR]	
Rabbit *	*Oryctolagus cuniculus*	O	
Sheep	*Ovis aries*	O	
Swamp Wallaby	*Wallabia bicolor*	O	
Amphibians			
Common Eastern Froglet	*Crinia signifera*	W	
Dwarf Eastern Tree Frog	*Litoria fallax*		W
Jervis Bay Tree Frog	*Litoria jervisiensis*	W	
Peron's Tree Frog	*Litoria peronii*		O W
Striped Marsh Frog	*Limnodynastes peronii*	W	O W

Note: * indicates introduced species
[TS] indicates threatened species
[MS] indicates Migratory species

All species listed are identified to a high level of certainty unless otherwise noted as:

[PR] indicates species identified to a 'probable' level of certainty – more likely than not
[PO] indicates species identified to a 'possible' level of certainty – low-moderate level of confidence

E - Nest/roost	H - Hair/feathers/skin	P - Scat	W - Heard call
F - Tracks/scratchings	K - Dead	Q - Camera	X - In scat
FB - Burrow	O - Observed	T - Trapped/netted	Y - Bone/teeth/shell
G - Crushed cones	OW - Obs & heard call	U - Anabat/ultrasound	Z - In raptor/owl pellet

3.3 Habitat results

3.3.1 Fauna habitat observations

The fauna habitats present within the site are identified within the following table.

Table 3.7 – Observed fauna habitat

Topography				
Flat ✓	Gentle ✓	Moderate	Steep	Drop-offs
Vegetation structure				
Closed Forest	Open Forest ✓	Woodland ✓	Heath	Grassland ✓
Disturbance history				
Fire	Under-scrubbing	Cut and fill works		
Tree clearing ✓	Grazing ✓			
Soil landscape				
DEPTH:	Deep ✓	Moderate ✓	Shallow	Skeletal
TYPE:	Clay ✓	Loam ✓	Sand	Organic ✓
VALUE:	Surface foraging ✓	Sub-surface foraging ✓	Denning/burrowing ✓	
WATER RETENTION:	Well Drained ✓	Damp / Moist ✓	Water logged ✓	Swamp / Soak ✓
Rock habitat				
CAVES:	Large	Small	Deep	Shallow
CREVICES:	Large	Small	Deep	Shallow
ESCARPMENTS:	Winter / late sunny aspects	Shaded winter / late aspects		
OUTCROPS:	High Surface Area Hides	Med. Surface Area Hides	Low Surface Area Hides	
SCATTERED / ISOLATED:	High Surface Area Hides	Med. Surface Area Hides	Low Surface Area Hides	

Feed resources				
FLOWERING TREES:	Eucalypts ✓	Corymbias	Melaleucas ✓	
	Banksias	Acacias ✓		
SEEDING TREES:	Allocasuarinas	Conifers		
WINTER FLOWERING EUCALYPTS:	C. maculata	E. crebra	E. globoidea	E. sideroxylon
	E. squamosa	E. grandis	E. multicaulis	E. scias
	E. robusta ✓	E. tereticornis ✓	E. agglomerata	E. siderophloia
FLOWERING PERIODS:	Autumn	Winter ✓	Spring ✓	Summer ✓
OTHER:	Mistletoe	Figs / Fruit	Sap / Manna ✓	Termites
Foliage protection				
UPPER STRATA:	Dense	Moderate ✓	Sparse ✓	
MID STRATA:	Dense ✓	Moderate ✓	Sparse ✓	
PLANT / SHRUB LAYER:	Dense ✓	Moderate ✓	Sparse ✓	
GROUNDCOVERS:	Dense ✓	Moderate ✓	Sparse ✓	
Hollows / logs				
TREE HOLLOWS:	Large	Medium	Small ✓	
TREE HOLLOW TYPES	Spouts / branch	Trunk ✓	Broken Trunk	Basal Cavities	Stags ✓
GROUND HOLLOWS:	Large	Medium ✓	Small ✓	
Vegetation debris				
FALLEN TREES:	Large	Medium ✓	Small ✓	
FALLEN BRANCHES:	Large ✓	Medium ✓	Small ✓	
LITTER:	Deep	Moderate ✓	Shallow ✓	
HUMUS:	Deep	Moderate	Shallow ✓	
Drainage catchment				
WATER BODIES	Wetland(s)	Soak(s)	Dam(s) ✓	Drainage line(s)	Creek(s) ✓	River(s)
RATE OF FLOW:	Still ✓	Slow ✓	Rapid	
CONSISTENCY:	Permanent	Perennial ✓	Ephemeral ✓	
RUNOFF SOURCE:	Urban / Industrial	Parkland	Grazing ✓	Natural ✓
RIPARIAN HABITAT:	High quality	Moderate quality ✓	Low quality ✓	Poor quality
Artificial habitat				
STRUCTURES:	Sheds ✓	Infrastructure ✓	Equipment ✓	
SUB-SURFACE	Pipe / culvert(s)	Tunnel(s)	Shaft(s)	
FOREIGN MATERIALS:	Sheet	Pile / refuse		

3.3.2 Habitat tree data

Hollow-bearing trees within the subject land were surveyed during the fauna survey with a total of fifteen (15) trees containing hollows recorded. These trees were found to contain fifteen (15) small hollows (0–10 cm in size) and four (4) medium hollows (10–15 cm in size).

Recorded hollows within the subject land are considered suitable for threatened microbats, Little Lorikeet and Squirrel Glider. Two (2) hollow-dependent threatened microbat Eastern Coastal Free-tailed Bat and Southern Myotis were recorded during survey.

Hollow-bearing tree data for the subject land is provided in Table 3.8. Each of these hollows will require removal for the proposed development layout. Further stag-watching of hollows would be considered appropriate given their suitability for threatened species use to ensure that they are not of breeding value to threatened biodiversity. This is not necessarily expected based on current observations.

Table 3.8 – Habitat tree data

Tag No.	Common name	DBH (cm)	Height (m)	Spread (m)	Vigour (%)	Hollows recorded
HT1	Scribbly Gum	37	14	8	75	1x 0-5cm branch, 1x 0-5cm branch spout
HT2	Smooth-barked Apple	45	20	13	35	1x 5-10cm branch
HT3	Smooth-barked Apple	38	21	19	35	1x 0-5cm branch spout
HT4	Scribbly Gum	45	17	15	40	1x 10-15cm low trunk split possum scratches
HT5	Smooth-barked Apple	32	22	10	55	1x 5-10cm broken trunk
HT6	stag	60	6	2	0	3x 0-5cm low cut branch spouts
HT7	Scribbly Gum	42,38	15	12	65	1x 0-5cm branch spout
HT8	Stringybark	65	9	13	55	1x 5-10cm low broken trunk
HT9	Stringybark	60	14	12	80	1x 0-5cm branch (wear)
HT10	Stringybark	43,35	14	15	75	1x 0-5cm low branch
HT11	Scribbly Gum	85	14	11	40	1x 20-30cm low open trunk
HT12	Scribbly Gum	50,60	18	19	85	1x 0-5cm trunk split, 1x 5-10cm branch (good)
HT13	Swamp Oak	32	3	5	15	1x 5-10cm low broken trunk
HT14	Scribbly Gum	41,34	15	8	75	1x 10-15cm trunk (good) scratches around hole
HT15	stag	50	6	2	0	1x 15-20cm low open broken trunk

Recorded significant habitat trees containing large hollows were located in the natural vegetated areas in the southern study area. These were expected to be utilised by the recorded Masked Owl. The individual recorded during initial survey responded quickly to calls suggesting it was close by at this time. The large hollows are also suitable to support nesting by a female within a central high quality hollow, and nearby roosting by a male in various large surrounding hollows. The cluster of large hollows were considered ideal for a Masked Owl breeding pair later confirmed by owl expert John Young (refer to Section 4.3.3a for details).

Biodiversity & Assessment 4

4.1 Previous surveys reviewed

The following regional vegetation mapping and reports were examined to identify the potential vegetation communities and other threatened biodiversity with potential to occur for assessment.

***The natural vegetation of the Wyong Local Government Area, Central Coast, New South Wales* (S. A. J. Bell, 2002)**

This mapping defines all remnant vegetation within the study area as Map Unit 31 – Narrabeen Doyalson Coastal Woodland (Figure 2.1).

Lower Hunter and Central Coast Regional Environment Management Strategy Vegetation Survey, Classification and Mapping; Lower Hunter and Central Coast Region (LHCCREMS) (*NPWS 2003*)

LHCCREMS (2003) vegetation mapping is shown in Figure 2.2, and does not recognise the thin strip of vegetation along the western boundary, nor the scattered trees surrounded by derived grassland. This mapping identifies the following communities within the study area:

- Coastal Plains Smooth-barked Apple Woodland
- Swamp Mahogany - Paperbark Forest
- Riparian Melaleuca Swamp Woodland

Biodiversity Constraints Assessment Report, 45 Mulloway Drive Chain Valley Bay - Travers bushfire & ecology Sept 2019.

This report identified the following ecological constraints within the site:

- Potential habitat within the study area for several threatened flora species. Seasonal targeted surveys for threatened flora was advised.
- Vegetation present within the south of the study area is attributable to *Swamp Sclerophyll Forest on Coastal Floodplains,* which is listed within the NSW *BC Act* as an Endangered Ecological Community (EEC).
- Breeding presence of Masked Owl. Protection buffers are required from the identified nest tree and potential roosting trees as outlined in the owl expert report provided.
- Hollows within the development landscape may also be utilised by recorded threatened microbats or to a lesser extent Squirrel Glider. Further survey was advised to assess hollow activity on dusk. Other survey to be undertaken at that time was also outlined.
- Biodiversity offsets were likely to be needed as the concept development exceeded both the Biodiversity Values, and the area clearing thresholds.

4.2 Flora

A number of landscaping species were observed within the development footprint. These were generally not taken into consideration in preparing the species list.

No threatened flora species were observed.

All species are listed in Table 3.1.

4.2.1 Local / Regional flora matters

A number of specimens of *Eucalyptus robusta,* which is classed as a regionally significant species by Wyong Council, were observed during the survey to the south of the development footprint.

4.2.2 State legislative flora matters

(a) Threatened flora species (NSW)

BC Act – No threatened flora species were observed within the study area during targeted survey.

(b) Endangered flora populations (NSW)

One (1) threatened flora population is known within 10 km. This population is:

- *Eucalyptus parramattensis* ssp*. parramattensis* in the Wyong and Lake Macquarie LGAs.

No specimens of *Eucalyptus parramattensis* subsp*. parramattensis* were observed within the study area during the initial biodiversity constraints inspection. It is considered that the presence of this species within the study area is unlikely.

As stated previously, PCT 1636 is aligned with Kincumber Scribbly Gum Forest (KSGF). However KSGF is restricted to a small area on the Bouddi Peninsula on the NSW Central Coast south of Kincumber. It only occurs in the Gosford LGA. Therefore the Coastal woodland vegetation within the study area does not correspond to the KSGF TEC.

PCT 1718 corresponds to the TEC known as *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-east Corner Bioregions* as listed within the NSW Biodiversity Conservation Act (2016).

(d) Ecosystem credit species

The BAM calculator does not predict threatened flora species for ecosystem credits.

(e) Species credit species

Based upon the BAM calculator, the following threatened flora species were considered as candidate species:

Table 4.1 – Species credit species (flora)

Scientific name	*BC Act*	*Associated PCTs*	Potential to occur (presence status)	Confirmed candidate species	Survey adequacy			Presence		Presence
					Preferred survey period (TBDC)	Actual survey period	Survey compliant (Yes/ No)	Assumed	Expert report	
Acacia bynoeana	E1	1636	unlikely	Yes	Sept–March	March, Sept, Nov	Yes	No	-	Absent (based on survey)
Angophora inopina	V	1636	moderate	Yes	All months	March, Sept, Nov	Yes	No	-	Absent (based on survey)
Astrotricha crassifolia	V	1636	unlikely	Yes	July–Dec	Sept, Nov	Yes	No	-	Absent (based on survey)
Callistemon linearifolius	V	1636	low	Yes	Sept–March	March, Sept, Nov	Yes	No	-	Absent (based on survey)
Corunastylis sp. Charmhaven	E4A	1636	low - Zones 1 & 2 no - Zone 3 (habitat degraded)	Yes	Nov–April	March, Nov	Yes	No	-	Absent (based on survey)
Cryptostylis hunteriana	V	1636	low - Zones 1 & 2 no - Zone 3 (habitat degraded)	Yes	Nov–Jan	Nov	Yes	No	-	Absent (based on survey)
Diuris praecox	V	1636	low - Zones 1 & 2 no - Zone 3 (habitat degraded)	Yes	Aug	March, Sept, Nov	No	Yes	-	Present - Zone 2 & 3 (Assumed); Absent - Zone 3 (habitat degraded)
Eucalyptus camfieldii	V	1636	low	Yes	All months	March, Sept, Nov	Yes	No	-	Absent (based on survey)

Scientific name	*BC Act*	*Associated PCTs*	Potential to occur (presence status)	Confirmed candidate species	Survey adequacy			Presence		Presence
					Preferred survey period (TBDC)	Actual survey period	Survey compliant (Yes/ No)	Assumed	Expert report	
Genoplesium insigne	E1	1636	moderate - Zones 1 & 2 no - Zone 3 (habitat degraded	Yes	Sept–Nov	Sept, Nov	Yes	No	-	Absent - Zones 1 & 2 (based on survey); Zone 3 (habitat degraded)
Grevillea parviflora subsp. *parviflora*	V	1636	moderate	Yes	Aug–Oct	Sept	Yes	No	-	Absent (based on survey)
Melaleuca groveana	V	1636	unlikely	Yes	All months	March, Sept, Nov	Yes	No	-	Absent (based on survey)
Prostanthera askania	E1	-	x	x	-	-	-	No	-	Absent (outside distribution)
Rutidosis heterogama	V	1636	unlikely - Zones 1 & 2 no - Zone 3 (habitat degraded)	Yes	All months	March, Sept, Nov	Yes	No	-	Absent - Zones 1 & 2 (based on survey); Zone 3 (habitat degraded)
Tetratheca glandulosa	V	1636	moderate - Zones 1 & 2 no - Zone 3 (habitat degraded)	Yes	Sept–Oct	Sept	Yes	No	-	Absent - Zones 1 & 2 (based on survey); Zone 3 (habitat degraded)
Tetratheca juncea	V	1636	moderate - Zones 1 & 2 no - Zone 3 (habitat degraded)	Yes	Aug–Nov	Sept, Nov	Yes	No	-	Absent - Zones 1 & 2 (based on survey); Zone 3 (habitat degraded)

Exclusions based on habitat features / survey

Exclusions from assessment have been based on habitat constraints provided in the BioNet TBDC, and geographic limits provided in the DPIE species profile web pages.

Excluded species are mentioned below:

Prostanthera askania

According to the geographic restrictions provided on the species profile page (https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10671) this species is restricted to south of Wyong River in Central Coast LGA. The subject land is to the North of Wyong River and well outside the species' distribution.

Exclusions from Zone 3 based on degradation of habitat

For the following species, potential habitat is present within Zones 1 and 2. Compliant survey has been undertaken in these Zones, except for *Diuris praecox*, as noted in Table 4.1. It is considered that Zone 3 (derived grassland) does not provide potential habitat due to the vegetation present being too degraded and disturbed. These species are generated by the BAM-C as potential candidate species because of the allocation of Zone 3 to PCT 1636, which is a woodland PCT, but this is only because of the requirements of the BAM to allocate a PCT to all vegetation zones. It is highly likely that Zone 3 did contain woodland vegetation but the current vegetation is derived pasture following clearing and agricultural land use, and now contain very few elements of the original woodland. Only a few native ground cover species are present (*Centella asiatica, Eragrostis brownii, Schenkia australis, Cynodon dactylon, Themeda triandra* and *Cheilanthes sieberi*) and these are common species that are able to colonise disturbed areas.

The additional fact that no individuals of these species were detected within the better-quality vegetation of Zones 1 and 2 provides support for the assertion that Zone 3 is very unlikely to provide habitat for the species mentioned below.

Corunastylis sp. Charmhaven

The final determination for this species (NSW Scientific Committee, 2012) states that this species occurs in low woodland to heathland with a shrubby understorey and ground layer. *Corunastylis* sp. Charmhaven is known to occur in slashed heath, but this species does not occur in highly disturbed pasture, as is present within Zone 3. Payne (2014) found this species beneath scattered trees within a paddock, which is a similar vegetation to that found in Zone 2 but not Zone 3, which does not include any native trees. Browsing by rabbits is listed as a key threatening process for this species so given the current and ongoing grazing pressure from livestock (including sheep and horses) and rabbits over several decades, it improbable that any individuals of *C.* sp. Charmhaven would be able to survive within Zone 3.

Cryptostylis hunteriana

As a saprophyte, *Cryptostylis hunteriana* is reliant on the symbiotic relationship with a mycorrhizal fungus found in decaying plant matter (Bell 2001). The high level of past and present disturbance within Zone 3 would have a significant influence on the soil fungi and levels of decaying matter. Nutrient inputs from livestock dung would have also degraded the soil, increasing the nutrient levels above what is suitable for this species. It is very unlikely that *C. hunteriana* would be able to persist in Zone 3. Bell (2001) states that *C. hunteriana* on the Central Coast occurs in woodland classified as either Coastal Plains Scribbly Gum Woodland or Coastal Plains Smooth-barked Apple Woodland. The former is similar or equivalent to PCT

1636. No occurrences within modified pasture or grassland are noted by Bell (2001). Similarly, Clarke et al (2003), in a study on the occurrence of *C. hunteriana* in the Shoalhaven LGA, found no occurrences of the species within grassland – all populations recorded occurred in forest vegetation communities. It is considered that Zone 3 is degraded and lacks suitable habitat for this species.

Genoplesium insigne

This species grows in patches of *Themeda triandra* amongst shrubs and sedges in heathland and forest according to Jones (2001), the TBDC and the Final Determination for the species (NSW Scientific Committee 2015). Whilst Zone 3 does contain *Themeda triandra* it is derived, in very low abundance (0–0.2 % PFC according to plot data) and not amongst shrubs and sedges. The vegetation within Zone 3 is derived grassland, not the heathland or forest where this species occurs (TBDC). Other associated species *Mirbelia speciosa, Ptilothrix deusta, Leptospermum trinervium, Banksia spinulosa, Xanthorrhoea latifolia,* and *Xanthorrhoea media* are lacking from Zone 3. As with *C.* sp. Charmhaven, browsing by rabbits is listed as a key threatening process for this species so given the current and ongoing grazing pressure from livestock (including sheep and horses) and rabbits over several decades, it improbable that any individuals of *G. insigne* would be able to survive within Zone 3.

Rutidosis heterogama

The TBDC states that this species "grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides". The vegetation within Zone 3 is derived grassland, and is not heath or open forest. While this species can tolerate disturbance, it is very unlikely to persist within Zone 3 where the original vegetation is cleared and the current vegetation is derived. It is considered that Zone 3 is degraded and lacks suitable habitat for this species.

Diuris praecox

The TBDC states that *Diuris praecox* "occurs in open forests which have a grassy to fairly dense understorey". Yare et al. (2020) confirms this association (referencing Jones 1991; Emergent Ecology 2017 and PlantNET 2019), stating that the *D. praecox* occurs in sclerophyll forests with a grassy or dense understorey. Again, we note that the vegetation within Zone 3 is derived grassland, and is not open forest or sclerophyll forest. *Diuris praecox* is not known to occur in derived grassland. This species is known to tolerate a level of disturbance, with some known populations occurring along tracks and maintained / slashed power line easements, and in fact at Glenrock SCA seems to prefer the slashed easements to adjacent intact forest (Yare et al. 2020). However, it must be noted that the disturbance along such powerline easements is largely limited to slashing, and the vegetation present is a disturbed variant of the surrounding forest that retains a large native species component in the shrub and ground layers. This is in contrast with the vegetation within Zone 3, which is derived grassland dominated by exotic species that has undergone complete clearing of the original vegetation. Zone 3 does not retain a native shrub layer, and what ground layer species are present are in very low abundance, and are common species that are able to colonise disturbed areas. It is considered that Zone 3 is degraded and lacks suitable habitat for this species.

Tetratheca juncea

The TBDC states that *Tetratheca juncea* occurs in low open forest/woodland with a mixed shrub understorey and grassy groundcover, and in heathland and moist forest. The vegetation within Zone 3 is derived grassland, and is not forest or woodland. This species can withstand disturbance by slashing or nearby clearing (Lake Macquarie City Council 2014) but it is not

known to persist in derived grassland where the original vegetation has been cleared. It is considered that Zone 3 is degraded and lacks suitable habitat for this species.

Tetratheca glandulosa

The TBDC states that this species is associated with shale-sandstone transition habitat where shale-cappings occur over sandstone, with associated soil landscapes such as Lucas Heights, Gymea, Lambert and Faulconbridge. The subject land occurs on Munmorah Conglomerate geology with no shale cappings, and the soil landscape is Doyalson. It is considered that the site therefore occurs on sub-optimal geology and soil type to support this species. The TBDC also states that this species occurs in "heaths and scrub to woodlands/open woodlands, and open forest". The vegetation within Zone 3 is derived grassland, and is not heath, scrub, woodland or forest. It is considered that Zone 3 is degraded and lacks suitable habitat for this species.

Shrubs and trees:

Zone 3 is also considered too degraded to support the candidate tree and shrub species (*Acacia bynoeana, Angophora inopina, Astrotricha crassifolia, Callistemon linearifolius, Eucalyptus camfieldii, Grevillea parviflora* subsp. *parviflora* and *Melaleuca groveana*) but it survey effort is sufficient to demonstrate absence of these species, and this has been used a justification for exclusion rather than degradation of habitat.

(f) Local data

Local data has not been used in this case.

(g) Expert reports

Expert reports have not been utilised for flora on this project.

4.2.3 Matters of national environmental significance - flora

(a) Threatened flora species (national)

EPBC Act – A search of the *BioNet* (DPIE, 2020) and the EPBC Search Tool provided a list of nationally threatened fauna species previously recorded, or with considered potential habitat, within a 10 km radius of the development footprint. These species have been listed and considered for habitat potential based on proximity and year of records in Table A1.1 (Appendix 1).

Based on this, it is considered that the development footprint provides varying levels of potential habitat for the following nationally listed threatened flora species:

Table 4.2 – Nationally listed threatened flora species with suitable habitat present

Scientific name	*EPBC Act* status	Potential to occur
Angophora inopina	V	✓
Genoplesium insigne	CE	✓
Tetratheca juncea	V	✓
Cryptostylis hunteriana	V	low
Diuris praecox	V	low
Eucalyptus camfieldii	V	low

Rutidosis heterogama	V	unlikely
Acacia bynoeana	V	unlikely
Corunastylis sp. Charmhaven	CE	unlikely
Eucalyptus parramattensis subsp. *decadens*	V	unlikely
Grevillea parviflora subsp. *parviflora*	CE	unlikely

No nationally listed threatened flora species were observed within the study area.

(b) Threatened ecological communities (national)

No nationally listed TECs were observed within the study area.

4.3 Fauna

All fauna species recorded during surveys, key fauna habitat observations and habitat tree data are provided in Section 3.

4.3.1 Key fauna habitat

Most notable habitat features for threatened fauna species considered with most potential to occur include:

- Trees containing mostly small (0–10 cm) and some medium (10–30 cm) hollows within the subject land,
- A patch of trees to the south containing large hollows suitable for large forest owls, most notably Masked Owl given their density, some being vertical spouts from broken trunks and the surrounding mosaic of dense and open understorey,
- Spring, summer and autumn flowering trees within the subject land,
- Winter flowering Swamp Mahogany within the natural vegetation in the southern study area,
- Seed producing *Allocasuarina* trees,
- Perennial drainage line with side soaks within the southern study area,
- Dense under-storey foliage areas within the southern study area, and
- Open water within the farm dam.

A complete assessment of the location of habitat trees and the size of hollows within was undertaken as part of 2019 surveys. Table 3.8 below provides hollow-bearing tree data and other habitat features recorded. Figure 2.3 provides locations of habitat trees.

A total of fifteen (15) trees containing hollows were recorded. These trees were found to contain fifteen (15) small hollows (0–10 cm in size) and four (4) medium hollows (10–15 cm in size). Each of these hollows will require removal for the proposed development layout. The two highest quality hollow-bearing trees (HT8 & HT12) were stag-watched during 2019 survey and HT1, HT2, HT3, HT4 & HT5 were stag-watched during 2020 survey, with no observations recorded. Other hollows considered most suitable for use by threatened species include HT4, HT11, HT14 and HT15 have not been stag-watched. This is recommended along with careful hollow removal measures to ensure effective recovery of all residing fauna as well as effective hollow relocations and/or replacement measures where hollows are used or of high quality.

Hollow-dependent threatened fauna species recorded during previous or recent surveys include the Masked Owl (T*yto novaehollandiae*), Eastern Coastal Free-tailed Bat (*Micronomus*

norfolkensis) and Southern Myotis (*Myotis macropus*). Hollows may also be suitable for other threatened microbats, Little Lorikeet and Squirrel Glider.

Other notable hollow-dependent fauna species recorded during surveys include Eastern Rosella, Galah, Musk Lorikeet, Rainbow Lorikeet, Scaly-breasted Lorikeet, Spotted Pardalote, White-throated Treecreeper, Yellow-tailed Black-Cockatoo, Common Ringtail Possum, Common Brushtail Possum, Eastern Freetail-bat, Gould's Wattled Bat, Large Forest Bat, Long-eared Bat, Little Forest Bat and Peron's Tree Frog.

No glider sap feed trees were identified. Small bird nests were found; however, no raptor nests or notable threatened bird species nests were identified to warrant specific protection. No other trees considered as important for habitat purposes were identified.

Recorded significant habitat trees containing large hollows located in the natural vegetated areas in the southern study area were expected to be utilised by the recorded Masked Owl. Whilst over six (6) large hollows were observed in a cluster in this southern area, one stood out above others as an ideal nesting tree based on its tree size, foliage shelter, hollow character and central proximity to the other large hollows. This tree was suspected to be a nesting tree for Masked Owl. This was later confirmed by owl expert John Young (refer to Appendix 7 for the owl expert report). An additional roosting tree further to the south-east on adjacent lands has also been confirmed.

4.3.2 Local fauna matters

Fauna species recorded present during survey and listed as a regionally significant species from Stage 1 of the *LHCCREMS - Regional Biodiversity Conservation Strategy* include the Yellow-tailed Black Cockatoo (*Calyptorhynchus funereus*) and Jervis Bay Tree Frog (*Litoria jervisiensis*).

Low potential breeding habitat and potential shelter habitat will be impacted for the Jervis Bay Tree Frog. Suitable foraging habitat for Yellow-tailed Black Cockatoo will be impacted. These species will be of benefit to retention of larger remnants and restoring connectivity along riparian channels within the study area such that habitat removal is unlikely to cause any significant change in local behaviour and viability.

4.3.3 State legislative fauna matters

(a) Threatened fauna species (NSW)

Five (5) *BC Act*-listed fauna species were recorded present during survey including Masked Owl (*Tyto novaehollandiae*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Little Bent-winged Bat (*Miniopterus australis*), Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*) and Southern Myotis (*Myotis macropus*). The Eastern Coastal Free-tailed Bat was recorded to a 'probable' level of certainty.

During 2019 surveys Masked Owl was recorded by mimicry calling by mouth given the suitability of habitat present. The individual recorded responded quickly suggesting it was close by at this time. The large nearby hollows were considered suitable to support nesting by a female within a central high-quality hollow, and nearby roosting by a male in various large surrounding hollows.

Whilst over six large hollows were observed in a cluster in this southern area, one stood out above others as an ideal nesting tree based on its tree size, foliage shelter, hollow character and central proximity to the other large hollows. This tree was suspected to be a nesting tree

for Masked Owl. The locations of these trees in a cluster containing large hollows were identified by GPS during initial survey (refer to Figure 2.3 for these locations).

Based on this, owl expert John Young was engaged and undertook a site visit between 30/8/19 to 3/9/19. Just prior to his visit, all other large hollows within 300 m of the suspected nest tree were also located by GPS, with some considered higher quality than others. Mr Young confirmed that Masked Owl is using the suspected nest tree and also confirmed another large hollow to the south-east as being used for roosting by the male. Mr Young's report and locations of all recorded large hollows is provided in Appendix 7.

This owl specialist report concluded that:

- The identified nest tree is central to activity and very important for protection with appropriate buffers;
- The recorded roost tree is well setback on adjacent lands however a number of other potential roosts have been identified and a precautionary approach to protect these with buffers is also warranted.
- Provided that these buffers are enforced with some additional measures to screen out development and future activity, Mr Young believed the birds will continue to remain here.

This owl specialist report recommended that:

- Prescriptive buffers of 100 m from a nest tree and 50 m from a roost tree be applied. These buffers are standard for forestry prescriptions by DPI and the 100m buffer from a nest tree is also outlined in the TBDC.
- The outer area of development should be heavily revegetated with dense foliage plants to act both as a sound and light barrier.

Suggested nest and roost buffers overlap and pass marginally into the cleared portions of the study area where development is proposed (refer to Figure 2.3). Mr Young has drawn a line of the southernmost development edge outside of these buffers in his report (Appendix 7). Suggested nest and roost buffers overlap and pass marginally into the cleared portions of the study area where development is proposed (refer to Figure 2.3). Mr Young has drawn a line of the southernmost development edge outside of these buffers in his report (Appendix 7). The development of roads and construction has been placed outside of this boundary. A small 0.037 ha portion of the buffer will extend into the APZ, yet this will be suitable as a foraging edge and will be offset with species credits.

Whilst Mr Young has also allowed for the placement of any necessary stormwater detention pond within the buffer, as the previous development design had proposed, he has also required a dense planting edge to provide a sound and light barrier between the road and development and the roost/nest trees.

This dense planting is to be placed along the road edge, not the existing vegetated edge, to permit an open foraging fringe in-between.

The Masked Owl is a specialist on hunting small to moderate sized terrestrial prey items and therefore depends on a mosaic of understorey structure. It will forage along the open edges of dense understorey patches and therefore would utilise the entire cleared edge of forest in the southern study area. Whilst a buffer is required from roosting and nesting trees, further measures as advised are necessary to reduce impacts to the foraging owls. This is particularly important given that the current layout provides a perimeter road along the southern limits of the subject land and this owl species, given its low foraging nature, is known to be susceptible to vehicle collisions.

This is of concern given that the proposed site entry road runs along the southern edge of the MHE village. A 10 km/hr vehicle speed restriction will be imposed for all internal roads within the MHE, which will significantly reduce or remove the chance of vehicle collisions. The current proposal provides a cleared and managed strip between the forest edge and the entry road for APZ purposes. This edge is preferable along the entirety of the forest edge to discourage low-flying, foraging owls from flying across the road. The planting of a dense strip of vegetation to act as a noise and light barrier should therefore be in addition to the cleared strip and placed closest to the road rather than taking the foraging edge closer to the road. This strip should be 1–2 m wide, dense enough to block lighting effects, and may for part of the landscaping treatment rather than native revegetation, although local indigenous species are recommended to be used.

The Wallum Froglet is known to occur and breed in locations directly across Chain Valley Bay Road. It is possible that individuals may disperse into the study area during ideal conditions, however the subject land itself is not of any likely importance for breeding, shelter or foraging for this species. The proposal will need to ensure adequate stormwater management measures are achieved within the subject land area, to prevent any water quality, quantity or erosion impacts on the adjacent natural drainage and habitat in the far southern reaches. There is some potential that the southern study area may be temporarily utilised by dispersing Wallum Froglet, given sinkholes retaining moisture present. These are not ideal or likely core breeding habitat for the local population but should nonetheless be protected from indirect impacts.

(b) Endangered fauna populations (NSW)

There are no endangered fauna populations within the Central Coast LGA.

(c) SEPP (Koala Habitat Protection) 2021

State Environmental Planning Policy (Koala Habitat Protection) 2021 (Koala SEPP 2021) applies to land within LGAs listed under Schedule 1 of the Policy. As the study area falls under the Central Coast Council LGA, it is considered that Koala SEPP 2021 applies to this development proposal.

Land to which this policy applies in accordance with Clause 6 of the SEPP 2021 is as follows:-

(1) This Policy applies to each local government area listed in Schedule 1.

(2) The whole of each local government area is—

(a) in the koala management area specified in Schedule 1 opposite the local government area, or

(b) if more than 1 koala management area is specified, in each of those koala management areas.

(3) Despite subclause (1), this Policy does not apply to—

(a) land dedicated or reserved under the National Parks and Wildlife Act 1974, or acquired under Part 11 of that Act, or

(b) land dedicated under the Forestry Act 2012 as a State forest or a flora reserve, or

(c) land on which biodiversity certification has been conferred, and is in force, under Part 8 of the Biodiversity Conservation Act 2016, or Land use zone Permitted land uses RU1 Primary Production Primary production, including agriculture and a diverse range of primary industry enterprises RU2 Rural Landscape Compatible rural land uses, including extensive agriculture RU3 Forestry Forestry land uses and other

development compatible with forestry land uses
*(d) land in the following land use zones, or an equivalent land use zone, unless the zone is in a local government area marked with an * in Schedule 1—*
(i) Zone RU1 Primary Production,
(ii) Zone RU2 Rural Landscape,
(iii) Zone RU3 Forestry.

The land is listed in Schedule 1 as the Central Coast Council LGA and is zoned as E3 Environmental Management; therefore, SEPP 2021 applies.
There is currently no approved Koala Plan of Management (KPoM) for the LGA that this site is located in. Therefore, before council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on Koalas or Koala habitat.

If the council is satisfied that the development is likely to have low or no impact on koalas or Koala habitat, the council may grant consent to the development application. If the council is satisfied that the development is likely to have a higher level of impact on Koalas or Koala habitat, the council must, in deciding whether to grant consent to the development application, take into account a Koala assessment report for the development.

Under Schedule 1 of Koala SEPP 2021, Central Coast Council falls within the Central Coast Koala Management Area. Five (5) tree species were recorded in the study area which are considered to be Koala use tree species within this Management Area under Schedule 2 of Koala SEPP 2021. These species are *Allocasuarina littoralis, Angophora costata, Corymbia gummifera, Eucalyptus haemostoma* and *E. robusta*.

A search on BioNet (DPIE 2020) found eighteen (18) records of Koala habitation within 10 km of the subject land. The closest records to the subject land are a cluster of three (3) located approximately 1.6 km to the east, all in 2003. These are also the most recent records within 2.5 km. Another record is located just beyond 2.5km to the west but is separated by Chain Valley Bay and Karignan Creek.

No Koalas were directly observed at the time of fauna survey, which included diurnal searches of trees, spotlighting and Rapid-SAT survey in 2019. Two additional SATs were undertaken in 2020. There was no secondary evidence of Koala habitation in the area including characteristic scratches on trees and scats beneath trees.

It is considered that this study area does not comprise Core Koala Habitat.

(d) Ecosystem credit species

Based upon the BAM calculator and field surveys to date, the following predicted threatened fauna species were considered as candidate species:

Table 4.3 – Ecosystem credit species (fauna)

Common name	*BC Act*	Potential to occur	Foraging habitat absent	Confirmed predicted species	Associated PCT
Large Bent-winged Bat (foraging)	V	Yes (recorded)	x	✓	1636(gd)/1636(pr)/1636(gl)
Little Bent-winged Bat (foraging)	V	Yes (recorded)	x	✓	1636(gd)/1636(pr)/1636(gl)
Eastern Coastal Free-tailed Bat	V	Yes (recorded)	x	✓	1636(gd)/1636(pr)/1636(gl)
Masked Owl (foraging)	V	Yes (recorded)	x	✓	1636(gd)/1636(pr)/1636(gl)

Eastern False Pipistrelle	V	Yes	n/a	✓	1636(gd)/1636(pr)/1636(gl)
Glossy Black-Cockatoo (foraging)	V	Yes	x	✓	1636(gd)/1636(pr)
Greater Broad-nosed Bat	V	Yes	n/a	✓	1636(gd)/1636(pr)/1636(gl)
Grey-headed Flying-fox (foraging)	V	Yes	x	✓	1636(gd)/1636(pr)
Little Lorikeet	V	Yes	n/a	✓	1636(gd)/1636(pr)
Powerful Owl (foraging)	V	Yes	x	✓	1636(gd)/1636(pr)
Square-tailed Kite (foraging)	V	Yes	x	✓	1636(gd)/1636(pr)
Swift Parrot (foraging)	E	Yes	x	✓	1636(gl)
Varied Sittella	V	Yes	n/a	✓	1636(gd)/1636(pr)
White-bellied Sea Eagle (foraging)	V	Yes	x	✓	1636(gd)/1636(pr)/1636(gl)
White-throated Needletail	-	Yes	n/a	✓	1636(gd)/1636(pr)/1636(gl)
Yellow-bellied Sheathtail-bat	V	Yes		✓	1718(good)/1636(gd)/1636(pr)/1636(gl)
Barking Owl (foraging)	V	Yes (unlikely)	x	✓	1636(gd)/1636(pr)/1636(gl)
Brown Treecreeper	V	Yes (unlikely)	n/a	✓	1636(gd)/1636(pr)
Eastern Chestnut Mouse	V	Yes (unlikely)	n/a	✓	1718(good)
Koala (foraging)	V	Yes (unlikely)	x	✓	1636(gd)/1636(pr)/1636(gl)
Little Eagle (foraging)	V	Yes (unlikely)	x	✓	1636(gd)/1636(pr)/1636(gl)
Eastern Osprey (foraging)	V	Yes (unlikely)	x	✓	1636(gd)/1636(pr)/1636(gl)
Scarlet Robin	V	Yes (unlikely)	n/a	✓	1636(gd)/1636(pr)
Spotted-tailed Quoll	V	Yes (unlikely)	n/a	✓	1636(gd)/1636(pr)/1636(gl)
Turquoise Parrot	V	Yes (unlikely)	n/a	✓	1636(gd)/1636(pr)/1636(gl)
Black-chinned Honeyeater	V	No (not likely)	n/a	✓	1636(gd)/1636(pr)
Gang-gang Cockatoo (foraging)	V	No (not likely)	x	✓	1636(gd)/1636(pr)
Golden-tipped Bat	V	No (not likely)	n/a	✓	1636(gd)/1636(pr)/1636(gl)
Grey-crowned Babbler	V	No (not likely)	n/a	✓	1636(gd)/1636(pr)
Painted Honeyeater	V	No (not likely)	n/a	x vagrant	
Speckled Warbler	V	No (not likely)	n/a	✓	1636(gd)/1636(pr)
Yellow-bellied Glider	V	No (not likely)	n/a	✓	1636(gd)/1636(pr)

The Painted Honeyeater has been excluded as a vagrant, backed up by an absence of records within the Wyong IBRA sub-region.

(e) Species credit species

Based upon the BAM calculator and field surveys to date, the following predicted threatened fauna species were considered as confirmed candidate species:

Table 4.4 – Species credit species (fauna)

Common name	*BC Act*	Potential to occur (species presence status) / Habitat	Breeding habitat absent	Survey adequacy			Presence of species		Confirmed candidate species	Associated PCTs
				Survey period (TBDC)	Actual survey period	Survey sufficient to rule out presence	Assumed	Expert report		
Large Bent-winged Bat (breeding)	V	Yes (recorded)	✓							
Little Bent-winged Bat (breeding)	V	Yes (recorded)	✓							
Masked Owl (breeding)	V	Yes (recorded)	x	May-Aug	June	x		✓	✓	1636(grass)
Southern Myotis	V	Yes (recorded)	n/a				recorded		✓	1636(good)/1636(poor)/ 1636(grass)
Glossy Black-Cockatoo (breeding)	V	Yes	✓							
Grey-headed Flying-fox (breeding)	V	Yes	✓							
Powerful Owl (breeding)	V	Yes	✓							
Square-tailed Kite (breeding)	V	Yes	✓							
Squirrel Glider	V	Yes	n/a	All	Jun / Dec	x	✓		✓	1636(good)/1636(poor)
Swift Parrot (breeding)	E	Yes	mapped	n/a	n/a	x	✓		✓	1636(grass)
Wallum Froglet	V	Yes	n/a	All	Jun / Dec	✓				
White-bellied Sea Eagle (breeding)	V	Yes	✓							
Regent Honeyeater (breeding)	E4A	Yes (low)	✓							
Barking Owl (breeding)	V	Yes (unlikely)	✓							
Bush Stone-curlew	E	Yes (unlikely)	n/a	All	Jun / Dec	✓				
Koala (breeding)	V	Yes (unlikely)	x	All	Jun / Dec	✓				
Little Eagle (breeding)	V	Yes (unlikely)	✓							
Osprey (breeding)	V	Yes (unlikely)	✓							
Pale-headed Snake	V	Yes (unlikely)	n/a	Nov-Mar	Dec	✓				
Brush-tailed Phascogale	V	No (vagrant)								
Common Planigale	V	No (vagrant)								
Long-nosed Potoroo	V	No (vagrant)								
Giant Burrowing Frog	V	No (vagrant)								
Eastern Pygmy Possum	V	No (not likely)								
Green and Golden Bell Frog	E	No (not likely)	n/a	Nov-Mar	Dec	✓				
Gang-gang Cockatoo (breeding)	V	No (not likely)	✓	Oct-Jan	Dec	✓				
Mahony's Toadlet	E	No (not likely)	n/a	Oct-Mar	Dec	✓				
Greater Glider	-	No (not likely)	n/a	All	Jun / Dec	✓				
Green-thighed Frog	V	No (not likely)								
Large-eared Pied Bat	V	No (not likely)								
Brush-tailed Rock Wallaby	E	No								

Note: Species credit species polygons are provided for confirmed candidate species on Figure 5.4 & 5.5.

Excluded species based on absence of habitat:

Eastern Pygmy Possum

Sufficient survey has not been undertaken to rule out presence of this species, however the species is not considered with potential to occur within the impacted habitat areas. The previous assessment generated species credits for the Eastern Pygmy Possum in the area of suitable habitat within PCT 1718. A revised layout has removed any impacts on this PCT. The species is also typically associated with the impacted PCT 1636, however it is considered that these impacted areas are not suitable due to their poor quality from fragmentation.

The largest area of good quality PCT 1636 with suitable trees and understorey for EPP is effectively less than 0.3 ha in size. This patch is however also separated from any larger and contiguous habitat remnant (PCT 1718) by more than 160 m. There are variations in recorded home ranges and population density for the species, yet this remnant size and its isolated distance is considered unsuitable to support any effective habitat.

For example, *Goldingay and Keohan* (2018) estimated the density of adult pygmy-possums in heath-woodland habitat to be 1.5–4.2 ha and *Bladen* et. al. (2002) recorded home ranges of (0.35 ± 0.14 ha) for males and (0.14 ± 0.06 ha) for females. Based on these findings, the patch in its own right may support one individual animal (only if in the upper density range calculated by *Bladen* et.al.) and this may be a male (only from the lower range of males calculated by *Goldingay and Keohan*). This indicates that the patch area is not likely to contribute to a breeding population, particularly also given the separation across a mostly cleared and managed landscape, would also not allow for effective recruitment or dispersal of individuals.

Gang-gang Cockatoo

Table 4.4 indicates that Gang-gang Cockatoo is not likely to occur within the subject lot. This is given that Gang-gang Cockatoo is only historically known to occupy the forested foothills of the mountains located west of the Sydney-Newcastle Freeway as the closest recorded and most suitable habitats. These species are not known to occupy any of the local floodplains and low undulating lands between the Tuggerah Lakes and Lake Macquarie.

The TBDC constraints for the species states that *assessors should look for SIGNS OF BREEDING on site as follows; (a) lone adult males identified during the breeding season (October to January); or (b) an occupied nest*. All hollows within the subject lot have been identified. Diurnal bird surveys have also been undertaken within the subject lot during the October to January period and none of the above indicating any site use has been recorded.

Green and Golden Bell Frog

The waterbodies within the study area include the drainage line within the retained vegetation to the south, some perennial sink holes adjacent to this and the constructed dam within the proposed development footprint. None of these aquatic habitats are considered suitable for breeding by GGBF, although the criteria outlined within the TDBC for suitability for the species is very broad.

This is described as being “within 1 kilometre of wet areas / swamp / waterbody”. This would be applied to almost any area along the NSW coast within the species range. The TBDC then gives prompting to refer to the *NSW Survey Guide for Threatened Frogs* (2020), for specific survey requirements.

These guidelines defines the following as ‘potential habitat’:

> *Suitable breeding and non-breeding shelter habitat consists of any waterbody with emergent aquatic vegetation and without the plague minnow (Gambusia holbrooki), although the GGBF will still occasionally breed in sites with this introduced pest fish. Foraging habitat and migratory habitat are areas of native and non-native vegetation.*

Again, the above criteria is too broad for a frog species that can utilise disturbed landscapes but has been demonstrated to not breed in poor quality or saline waters, both of which can contain emergent aquatic vegetation as described above.

The dam present on site is too deep and steep sided with no emergent vegetation providing in-water shelter opportunity and no shallow sandy substrate. Mosquitofish were also recorded present in the dam. The swamp habitat in the lower southern depressions of the site does not sustain large open water breeding opportunity that will prolong for long enough after summer rains to support the tadpole development period and these potholes are well shaded by the surrounding dense *Gahnia* vegetation. GGBF is a diurnal basking species.

The southern drainage line itself receives flows during rain events, which will not be utilised by GGBF as a wetland breeding species.

The *NSW Survey Guide for Threatened Frogs* (2020) defines the following as a requirement for mapping the species polygon:

> *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 200 metres radius from the top of bank. The polygon should include minimum 50 metre wide corridors of native and non-native vegetated areas linking the available waterbodies, where relevant.*

No other nearby high quality breeding potential from wetlands or high-quality dams are present within 200 m of the site that may permit dispersal to this location. Therefore, the site is also not likely to support shelter or overwintering habitat.

Notwithstanding the habitat present, sufficient survey for GGBF presence was carried out during ideal weather conditions on the 10th and 15th December 2020. Both survey nights included tadpole species searches within all waterbodies present. The *NSW Survey Guide for Threatened Frogs* (2020) requires 4 nights of repeat surveys for GGBF but 2 tadpole search surveys “can be used to replace up to two of the aural-visual surveys”.

Notably, in the weeks leading up to the nocturnal survey on the 15/12/20, there had been cycles of rainfall, with 20 mm falling within the 24hr period prior to survey. The afternoon and night of survey was subject to light drizzle and was consistently warm (~22°C) and was therefore considered adequate for summer frog survey including aural-visual surveys for GGBF. Whilst these surveys were undertaken not specifically targeting GGBF but rather Mahony’s Toadlet in the southern study area as a result of comments received by the Biodiversity and Conservation Division (dated 14 July 2020) for a similar nearby site to the west, the survey undertaken is still sufficient in accordance with the guidelines.

GGBF was not recorded during call surveys, spotlighting, diurnal habitat searches and tadpole observations.

Common Planigale

This species has been entered as a vagrant as it has not been historically recorded in the immediate locality out to 10 km and beyond. Figure 4.1 shows the closest historical *BioNet*

record of Common Planigale is actually located north of Newcastle and outside of the Wyong IBRA subregion boundary. This record is located over 42 km away from the subject lot to the north and also represents the most southern record of the species range on *BioNet*.

The TBDC distribution comment for the species states that it occurs in *Coastal north-eastern NSW, coastal east Queensland and Arnhem Land. The species reaches its confirmed southern distribution limit on the NSW lower north coast however there are reports of its occurrence as far south as the central NSW coast west of Sydney.*

The Australian Museum's *Atlas of Living Australia* database was also consulted for regional records. This database does add a further four records south of Newcastle and also south of the subject lot. Two of these are located at Mosman from 1976, one near Hornsby in 2015, and one at Jervis Bay on the south coast in 2014. Whilst these demonstrate the species distribution extends further south, none of them are also from the Wyong IBRA subregion.

Figure 4.1 – Closest Common Planigale record

Long-nosed Potoroo

This species has been entered as a vagrant as it has not been historically recorded in the immediate locality. Figure 4.2 shows a 20 km radius from the subject lot and the three closest historical *BioNet* records of Long-nosed Potoroo. Whilst these records are still within the Wyong IBRA subregion boundary, they are all beyond 20 km in distance. These are also the closest recorded locations from the Australian Museum's *Atlas of Living Australia* database.

The TBDC explains that *a dense understorey with occasional open areas is an essential part of habitat* for the Long-nosed Potoroo. This well describes the undisturbed portions of PCT 1718 however no such suitable habitat exists within the proposed development footprint anyway. The open and disturbed vegetated polygons of PCT 1636 within the development

footprint do not provide adequate terrestrial shelter for the species and the better quality remnant down the western boundary is isolated.

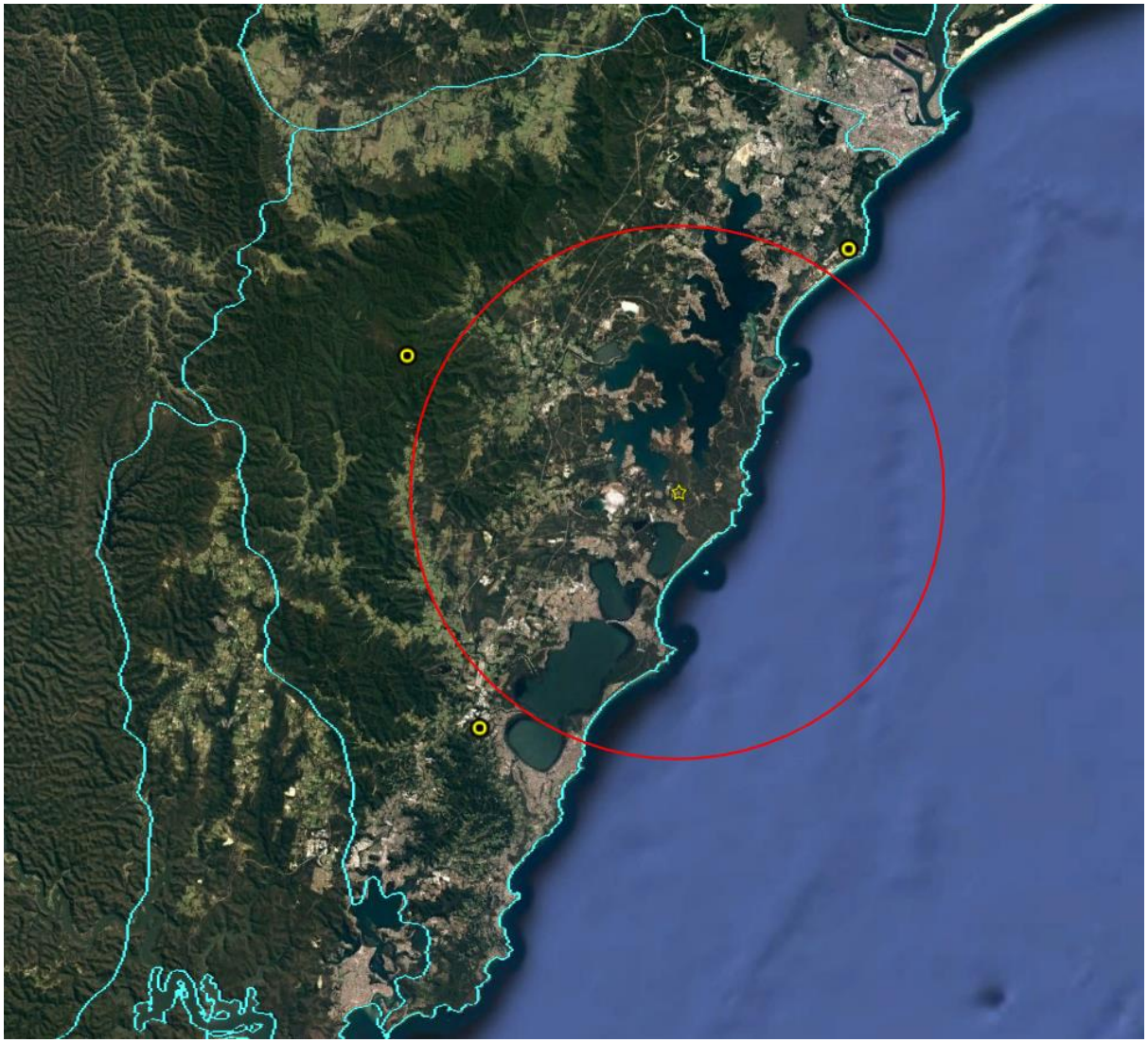


Figure 4.2 - Closest Long-nosed Potoroo records

Brush-tailed Phascogale

This species has been entered as a vagrant as it has not been historically recorded in the immediate locality out to 10 km and beyond. Figure 4.3 shows historical *BioNet* records of Brush-tailed Phascogale between Sydney and Newcastle, as well as several records north of Newcastle, and this also demonstrates that the species has never been recorded east of the Pacific Motorway. These coastal areas of the Central Coast east of the Pacific Motorway are considered sufficient to classify as vagrant in the IBRA subregion. The closest two records are located within Olney State Forest over 18 km away to the north-west from 2002 (refer also to lower part of Figure 4.3).

The TBDC defines that the species prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. The natural forest and low shrubby understory within the study area and the immediate local surrounds is all quite dense which is not as preferred as the more open understory habitats utilised most by this species. The open landscape within the development footprint itself (and adjacent properties) is the result of

previous clearing and management and is extensive along the remaining edges of Karignan Creek to the west.

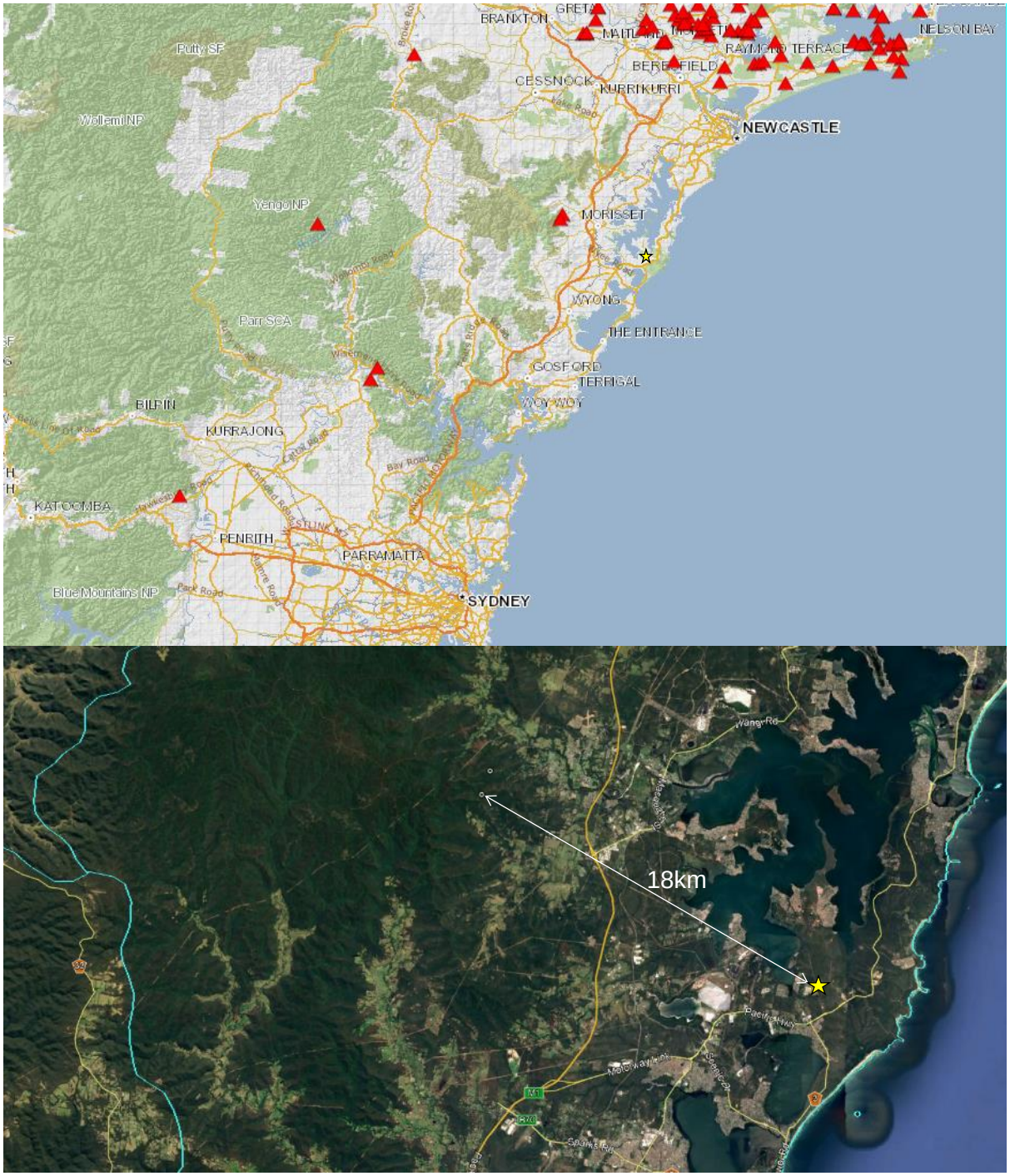


Figure 4.3 – Brush-tailed Phascogale *Bionet* records
Newcastle – Sydney (above) and within the IBRA Subregion (below)

Large-eared Pied Bat

The habitat constraint identified for this species by the TBDC is described as locations *within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or*

crevices, or within two kilometres of old mines or tunnels. The site is located well beyond 2 km from any rocky habitats likely containing potential roosting opportunity.

Green-thighed Frog

Within the Central Coast region, the Green-thighed Frog is a foothills species occupying the steeper open forest slopes west of the Sydney-Newcastle Freeway. The species will move down to breed on the lower foothills often adjacent to moist forest habitats and swamp forests where the slopes transition onto the floodplain, however the species does not extend far out into these landscapes. There is no such typical habitat within and adjacent to the study area and this is also demonstrated by an absence of any records within 10 km of the site.

There are no specific habitat constraints identified by the TBDC, the notes on the species instead direct towards the requirements of the *NSW Survey Guide for Threatened Frogs* (2020). These guidelines define potential habitat as:

> *Suitable breeding habitat is any semi-permanent or ephemeral waterbody of >25 square metres in surface area located within native vegetation or immediately adjacent to or within 10 metres of native vegetation. Non-breeding habitat is native vegetation adjacent to the breeding habitat.*

The dam within the site is not located within or immediately adjacent to native vegetation. It is surrounded by a highly managed landscape with a separation to the southern natural vegetation of 220 m and by Chain Valley Bay Road from other natural vegetation to the east.

The temporary potholes in the southern portions of the site would not each be larger than 25 m^2 even when inundated after flooding rains and the species does not breed in flowing creeks. No other such suitable breeding opportunities as described by the guidelines, that a species polygon could be drawn from, occur within 200 m of the site. Therefore the proposed development footprint is not likely to impact on suitable breeding habitat or its buffers.

Mahony's Toadlet

The site is characterised by erosional soils from the Doyalson landscape in the central and upper northern portions and these flow down to swamp and alluvial soils of the Tacoma Swamp and Wyong landscapes into and along Karignan Creek. These soil types do not support Mahony's Toadlet which is associated with bleached aeolian sandy substrates such as supporting the Norah Head and Tomago populations.

Despite this, target surveys for the species was undertaken during ideal conditions in December 2020. These site visits were preceded by a targeted search for Mahony's Toadlet and Wallum Froglet at a known occurrence site at Norah Head, NSW. No *Uperoleia* species were heard calling within the study area during surveys.

Giant Burrowing Frog

There are no specific habitat constraints identified by the TBDC for Giant Burrowing Frog, the notes on the species instead direct towards the requirements of the *NSW Survey Guide for Threatened Frogs* (2020). These guidelines define suitable breeding habitat as:

> *ephemeral flowing streams that have permanent pools, or in upland swamps, and are located within native vegetation. Most typically breeding occurs in streams with a bed width of up to five metres (e.g. 2nd order and 3rd order streams) and upland swamps located on suitable geologies. Non-breeding habitat is native vegetation adjacent to the breeding sites.*

The above definition is very broad, there is mention of suitable geologies but no mention of what that is. Figure 4.4 shows Giant Burrowing Frog records between Sydney and Newcastle. The records in this view are the most north-eastern records within the species known range. The species has never been recorded in the lower landscapes surrounding Tuggerah Lakes or Lake Macquarie or anywhere east of the Pacific Motorway in the local region. Whilst some records within this view are still located within the Wyong IBRA subregion, these records are located in the far western portions.

Whilst the literature indicates that Giant Burrowing Frog occurs in a range of soil types and dry forest communities, the records in the closest most northern extent of its range (north of Sydney) well aligns with sandy soils on plateau areas in heath and low open forest communities. It's not a floodplain breeding species in this region.

The study area and nearby surrounds does not support sandy plateau habitat and perennial breeding holes used by this species for breeding and burrowing / shelter in the region. As the species range has never been demonstrated to extend into the middle or eastern portions of the Wyong IBRA subregion, or beyond this to the north, the species has been entered into the BAM-C for the study area as a vagrant.

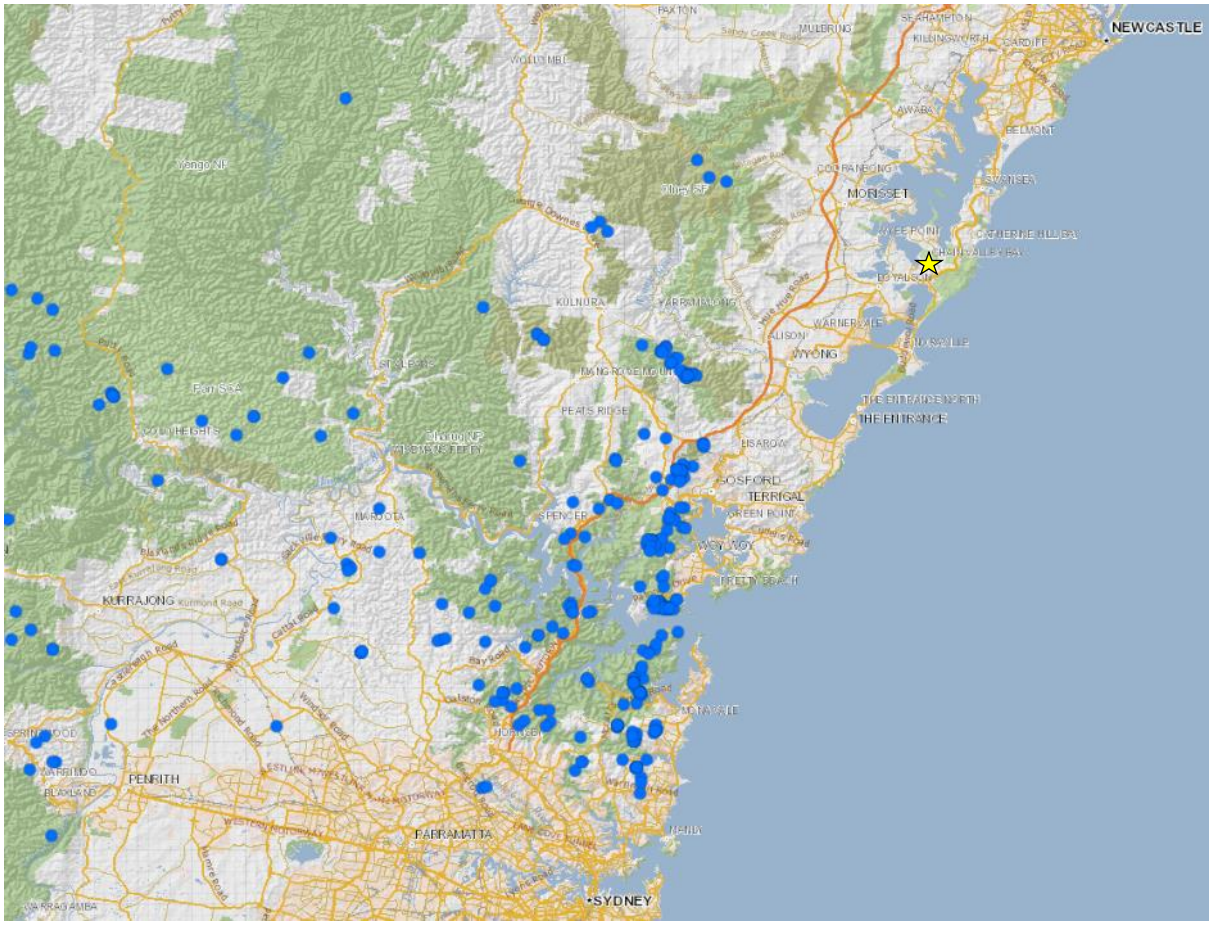


Figure 4.4 – Giant Burrowing Frog records between Sydney and Newcastle

Brush-tailed Rock Wallaby

The habitat constraint identified for this species by the TBDC includes *land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines*. The site is

located further away than 1 km from any rocky escarpments providing the core habitats suitable for this species.

Excluded species based on the absence of breeding habitat:

Large Bent-winged Bat and *Little Bent-winged Bat*

While the Little Bent-winged Bat was recorded, there are no caves or mine shafts present in the study area that may be utilised for breeding by either species.

Glossy Black-Cockatoo

The site does contains large hollows but they are not considered suitable for nesting (dead, open and emergent large branch spouts).

Excluded species based on the absence of important mapped habitat:

Regent Honeyeater

The site is not mapped as containing important habitat for this species on the *BAM - Important Areas* (*DPIE*) mapping.

Included species based on the presence of important mapped habitat:

Swift Parrot

The southern vegetated portions of the study area accounting for the majority of PCT 1718 is mapped as containing important habitat for this species on the *BAM - Important Areas* (*DPIE*) mapping (refer to Figure 4.5). The proposed development will impact 0.08 ha of this mapped area, thus offsets are required for this species even though no Swamp Mahogany feed tree will be impacted. This area is used for establishing the species polygon and, subsequently, species credits for offsetting.

Figure 4.5 – Swift Parrot Important Areas Mapping (Source: DPIE 2021)

(f) Local data

Local data has not been used in this case.

(g) Expert reports

Expert reports have not been utilised to determine presence or absence of candidate fauna in replacement of survey on this project. Owl expert John Young was engaged to advise of appropriate avoidance and minimisation methods to the recorded Masked Owl and suspected breeding habitat to the nearby south during earlier site constraints level analysis. Mr Young is not has not received approved expert status by DPIE. Mr Young's report is provided in Appendix 7 and a summary of conclusions and recommendations is provided in Section 4.3.3.a above.

4.3.4 Matters of national environmental significance - fauna

(a) Threatened fauna species (National)

EPBC Act – A search of the *BioNet* (DPIE, 2020) and the EPBC Search Tool provided a list of nationally threatened fauna species previously recorded, or with considered potential habitat, within a 10 km radius of the development footprint. These species have been listed and considered for habitat potential based on proximity and year of records in Table A1.2 (Appendix 1), and those with potential habitat within the development footprint are considered in the seven-part test within Appendix 3.

Based on this, it is considered that the development footprint provides varying levels of potential habitat for the following nationally listed threatened fauna species:

Table 4.5 – Nationally listed threatened fauna species with suitable habitat present

Common name	*EPBC Act*	Potential to occur
Swift Parrot	E	✓
Spotted-tailed Quoll	E	✓
Grey-headed Flying-fox	V	✓
Regent Honeyeater	CE	low
Koala	V	unlikely

As the development footprint does not contain any likely roosting or subsequent breeding habitat and foraging habitat will remain well represented in the locality, it is concluded that there will not be any significant impact on any nationally listed threatened fauna species with potential to occur, as a result of the proposal.

(b) Protected migratory species (National)

The EPBC Act Protected Matters Report provides additionally listed terrestrial, wetland and marine migratory species of national significance likely to occur, or with habitat for these species likely to occur, within a 10 km radius of the subject land. The habitat potential of migratory species is considered in Table A 1.3 (Appendix 1).

One (1) nationally protected migratory bird species the Black-faced Monarch was recorded only to a 'possible' level of certainty from a brief distant call within the natural open forest vegetation on adjacent land to the south-west. The proposal will not directly impact on any potential breeding or important foraging habitat for this species.

Other migratory species protected under the EPBC also do not likely contain any breeding habitat or habitat otherwise of importance within the subject land. Therefore, protected migratory species will not likely offer constraint to the proposal.

4.4 Watercourses, GDEs & Wetlands

4.4.1 Endangered wetland communities

A number of wetland communities have been listed as TECs under the *BC Act*. We note that 'wetlands' are included in the definition of 'waterfront lands' in accordance with the *Water Management Act 2000* (*WM Act*) due to their inclusion in the definition of a 'lake' under the same Act. TECs that are considered to be an endangered protected wetland are as follows:

- Artesian springs ecological community
- Castlereagh Swamp Woodland Community
- Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner bioregions
- Coastal Upland Swamp in the Sydney Basin bioregion
- Coolibah–Black Box woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands bioregions
- Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Kurri sand swamp woodland in the Sydney Basin Bioregion
- Lagunaria swamp forest on Lord Howe Island
- Maroota Sands swamp forest
- Newnes Plateau Shrub Swamp in the Sydney Basin Bioregion

- Swamp oak floodplain forest of the NSW North Coast, Sydney Basin and South East Corner bioregions
- Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions
- The shorebird community occurring on the relict tidal delta sands at Taren Point
- Upland wetlands of the drainage divide of the New England Tableland Bioregion
- Wingecarribee Swamp

In accordance with the NSW DPI - Office of Water - Guidelines for Controlled Activities (2012) protection may apply to these communities subject to offset provisions. Where they are mostly cleared, highly fragmented or highly disturbed, consolidation and management in accordance with a Vegetation Management Plan is recommended. The protection provided is considered in the landscape context and in consultation with NSW Natural Resources Access Regulator (NRAR) undertaken to confirm the appropriateness of setbacks.

Swamp Sclerophyll Forest on Coastal Floodplains (SSF) is present within the southern portion of the study area, which is a TEC as listed under the *BC Act*, but not under the *EPBC Act*. SSF is an endangered wetland community as listed above.

- *Impact on the extent of wetland vegetation*

  The proposal is not on the extent of this endangered wetland community.

- *Impact on acid sulphate soils*

  The study site is not identified as containing acid sulphate soils.

- *Indirect impacts of wetlands*

  Indirect impacts may include pedestrian usage and trampling of soils, dumping of rubbish and garden waste, accidental spillages post development.

  As part of the proposal a Vegetation Management Plan (VMP) is to be prepared to protect, and mitigate impacts on, the SSF.

- *Impacts due to storm water quality or quantity*

  It is expected that an appropriate storm water management plan will be prepared to avoid these impacts on the TEC.

- *Impacts on groundwater*

  The proposal is not expected to impact on groundwater resources or groundwater dependent ecosystems.

- *Proposed mitigation measures*

  1. Appropriate design of construction of any works e.g. storm water outlets.
  2. Manage access to the area.
  3. Undertake pest animal and weed control.
  4. Preparation of a VMP to improve and maintain sensitive ecological landscapes, sediment and erosion control measures.

- Watercourses and waterfront lands

There are no riparian streams or zones throughout the development footprint. The Karignan Creek corridor forms the southern boundary of the subject lot, but is outside the development footprint. The area of SSF is classed as an endangered protected wetland and is a 'lake' as defined under the *WM Act* therefore it is deemed as 'waterfront land'.

In accordance with the *WM Act*, endangered wetland communities are through the definition of 'lakes' potentially classed as waterfront land. Referral to NSW Natural Resources Access Regulator (NRAR) may be required for determination under the *WM Act* as a controlled activity.

4.4.2 Groundwater dependent ecosystems (GDEs)

Groundwater dependent ecosystems (GDEs) are communities of plants, animals and other organisms whose extent and life processes are dependent on groundwater. Some examples of ecosystems which depend on groundwater are:

- wetlands;
- red gum forests, vegetation on coastal sand dunes and other terrestrial vegetation;
- ecosystems in streams fed by groundwater;
- limestone cave systems;
- springs; and
- hanging valleys and swamps.

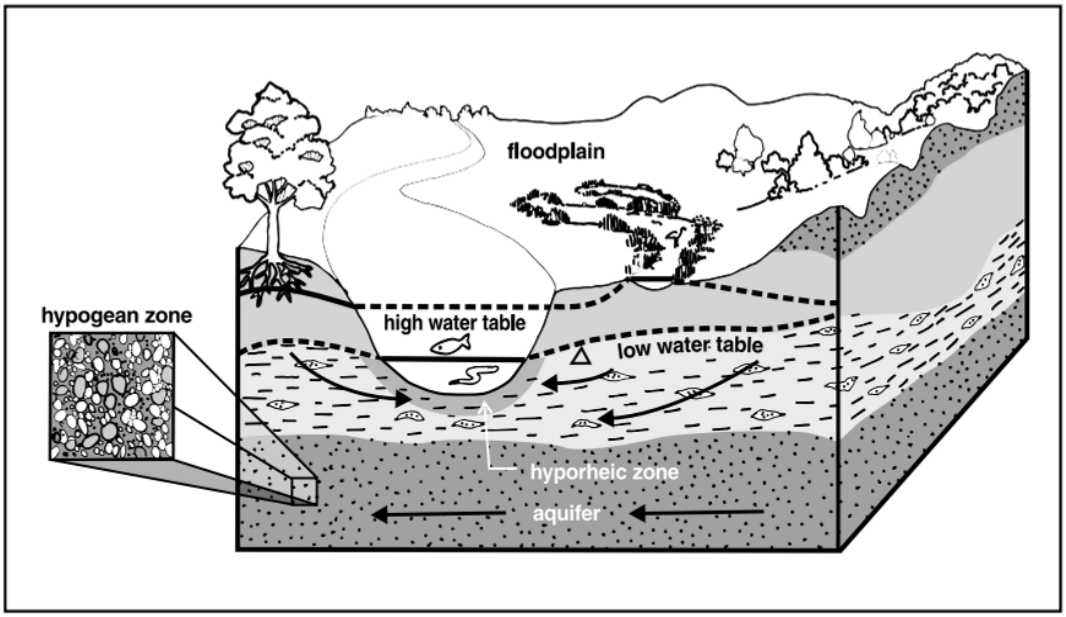


Figure 4.6 – Alluvial groundwater system discharging into a river

GDEs are therefore ecosystems which have their species composition and their natural ecological processes determined by groundwater (NSW State Groundwater Dependent Ecosystems Policy April 2002).

Swamp Sclerophyll Forest on Coastal Floodplains is considered to be a wetland community and, in the context of the landscape is classed as a GDE. To assist in protecting this in the future, this community is to be conserved and managed in accordance with the VMP.

4.4.3 Watercourses

The proposed development will not directly impact on watercourses or drainage lines (Figure 1.8).

4.4.4 State Environmental Planning Policy (Coastal Management) 2018

State Environmental Planning Policy (Coastal Management) 2018 updates and consolidates into one integrated policy SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), including clause 5.5. of the Standard Instrument – Principal Local Environmental Plan. These policies are now repealed.

The Coastal Management SEPP gives effect to the objectives of the *CM Act* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone.

An integrated and coordinated approach to land use planning is promoted by the new SEPP. It defines the four coastal management areas in the Act through detailed 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 Coastal Management SEPP identifies development controls for consent authorities to apply to each coastal management area to achieve the objectives of the *CM Act*.

The Coastal Management SEPP establishes the approval pathway for coastal protection works.

Wetlands on site or adjacent

The NSW DPIE *Coastal Wetlands and Littoral Rainforests Area Map* (http://webmap.environment.nsw.gov.au/PlanningHtml5Viewer/?viewer=SEPP_CoastalManagement) does not map any coastal wetlands or proximity areas for coastal wetlands within the study area. The closest proximity area is some 700 m to the west, and will not be impacted by the proposal (Figure 4.7).

Figure 4.7 – Coastal wetlands area map

Impact assessment

5

5.1 BOS thresholds

The BOS includes three (3) elements to the threshold test – an area trigger, a Biodiversity Values Land Map trigger and the Test of Significance. If impacts exceed at least one of these triggers, the Biodiversity Offset Scheme applies to the proposed clearing.

5.1.1 Biodiversity Values Land

Biodiversity Values Land has been mapped within the south of study area and will be impacted by the proposal (refer to Figure 5.1) – therefore the BOS is triggered under this threshold test.

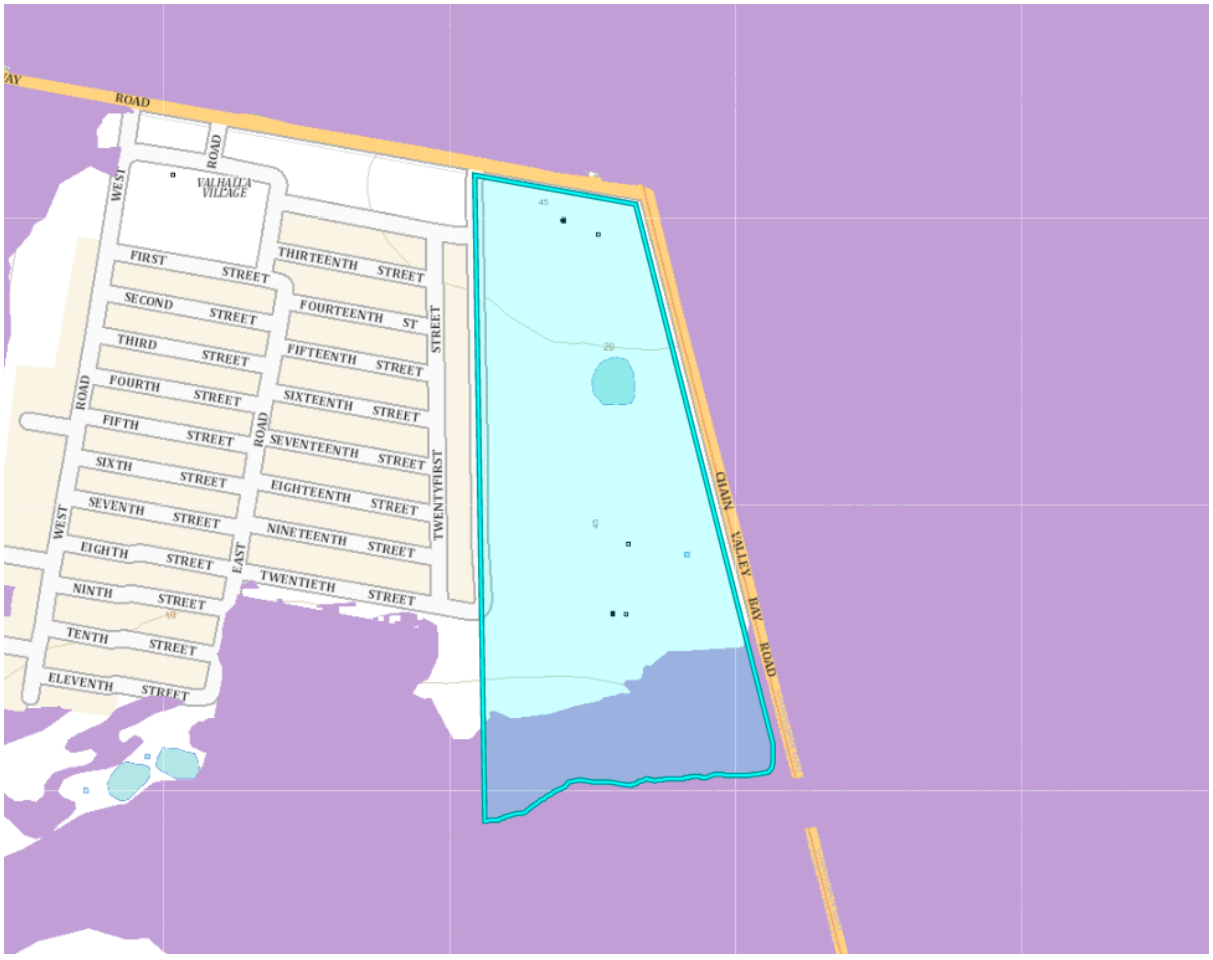


Figure 5.1 – Biodiversity Values (purple) relative to the study area (blue)

(Source: https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BosetMap)

5.1.2 Area clearing threshold

The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP).

The area threshold applies to all proposed native vegetation clearing associated with a development proposal – for example in the case of a subdivision; all future clearing across the lots subject to the subdivision, must be considered. Thresholds outlined under the BOS are outlined in the table below.

Table 5.1 identifies that the site has a minimum lot size of 40 ha, and the clearing area threshold for which the BOS applies is 1 ha. Removal of 1 ha or greater of native vegetation will thrigger this threshold, and will require offsetting under the BOS.

Table 5.1 – BOS entry threshold report

Date of Calculation	27/07/2021 5:02 PM		**BDAR Required***
Total Digitised Area	6.51	ha	
Minimum Lot Size Method	LEP		
Minimum Lot Size	40	ha	
Area Clearing Threshold	1	ha	
Area clearing trigger Area of native vegetation cleared	Unknown #		Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	yes		yes
Date of the 90 day Expiry	N/A		

5.1.3 Test of significance

As the BOS clearing and Biodiversity Values thresholds are triggered, and the BOS applies, a test of significance is not required.

5.2 Avoidance and minimisation actions

The following strategies and actions have been undertaken to either avoid or minimise impacts on biodiversity values:

<u>*Direct and indirect impacts*</u>
The proposal has been located to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat by:

- Impacts on the TEC SSF have been minimised by:
    - Locating the proposal in areas that are cleared and contain non-TEC vegetation.
    - The proposal has been designed to retain all SSF within the study area
    - A buffer to the SSF has been provided to avoid indirect impacts. This buffer will be partially revegetated with native shrubs to APZ standards.
    - The portion of land containing the SSF will be re-zoned from E3 (Environmental Management) to E2 (Environmental Conservation), which will provide greater protection from future impacts

- Impacts to the majority of the mapped Swift Parrot habitat have been avoided:
    - The proposal has been designed to avoid direct impact to the mapped important areas for Swift Parrot.
    - All Swamp Mahogany trees, which provide winter foraging resources for Swift Parrot, will be retained within the southern buffer area and will not be impacted.

- Indirect impacts on the recorded Masked Owl have been avoided by:
    - Avoiding impacts on a confirmed Masked Owl breeding hollow to the south of the subject lot by not undertaking any major habitat alteration within a 100 m buffer from this hollow.
    - Avoiding impacts to other potential roosting hollows within the study area by not undertaking any major habitat alteration within a 50 m buffer from these.
    - A stormwater detention basin is proposed in the outer edges of these buffers which may increase foraging habitat opportunity along the forest edge. Otherwise, all other development and infrastructure such as roads and residential lots have been further setback from the forest edge (as described further below under the VMP) allowing the owls an opportunity to forage along the complete forest edge. Fencing will provide a protective barrier to the perimeter road at this southern extent to reduce noise and reduce potential for vehicle strike.
    - Major construction works, including construction of the sedimentation dam and internal roads, is only to be undertaken outside of the Masked Owl breeding period of May–August.

- A VMP is to be prepared to assist with rehabilitation, ecological restoration and ongoing maintenance of retained SSF vegetation, and to ensure protection of Masked Owl breeding habitat. A buffer to the SSF has been provided which will be partially revegetated with native shrubs to APZ standards. A development-exclusion buffer area (allowing for a stormwater detention basin) is required in the southwestern corner of the subject land as a protection measure for a pair of Masked Owls utilising nearby trees for breeding. This area forms part of the buffer zone to the SSF. A dense planting of vegetation is required along this southern cleared edge as a sound and light barrier between the proposed activity and the owls. Installation of protective fencing will aid as an additional barrier to light and sound in this area. Further to this, a minimum 10 m cleared setback from the road is also required along this edge to reduce potential for vehicle collisions.

Additional avoidance and minimisation actions have been undertaken:

- Development has been located taking advantage of the existing cleared and disturbed potions of the subject lot.

5.3 Potential ecological impacts

The direct, indirect and cumulative ecological impacts have been considered in respect to recorded biodiversity, threatening processes and extent of impact as a result of the proposed works.

5.3.1 BC Reg Prescribed impacts

Feature	Present (yes / no)	Description of feature characteristics and location	Potential impact	Threatened species or community using or dependent on feature	Section of the BAR where prescribed impact is addressed
Karst, caves, crevices, cliffs, rocks or other geological features of significance	no	n/a	n/a	n/a	n/a
Human-made structures	no	n/a	n/a	n/a	n/a
Non-native vegetation	no	n/a	n/a	n/a	n/a
Habitat connectivity	yes	Regional corridor	Very slight reduction in regional corridor width	Squirrel Glider	5.3.1
Waterbodies, water quality and hydrological processes	yes	Dam in north of site	Removal of foraging habitat	Large Bent-winged Bat, Little Bent-winged Bat, Eastern Coastal Free-tailed Bat but primarily Southern Myotis	5.3.1.
	yes	Hydrological processes: EEC and stream to the south	Indirect impacts	Swamp Sclerophyll Forest	5.3.1
Wind farm development	no	n/a	n/a	n/a	n/a
Vehicle strikes	yes	Southern portions of the perimeter road.	On terrestrial mammals and frogs as well as birds in flight.	n/a	5.3.1

The following potential impacts on biodiversity values as a result of the proposal are prescribed (as per clause 6.1 of the *BC Reg*) as biodiversity impacts to be assessed under the biodiversity offsets scheme:

- *Habitat connectivity*

  The strip of PCT 1636 (good) vegetation to be impacted only currently provides cross-site value for flying species, as with the individual trees elsewhere through the site and therefore not ideally providing 'connective' values as such, but rather a stepping stone.

  This stepping stone also is not of notable value as it is not the only link between habitats to the north and south, it is simply a more direct path than going around via the east. If it did provide connectivity throughout its value would not be as a more direct route but rather a passage for terrestrial species to avoid the busier road of Chain Valley Bay Road and only require passage across one road (Mulloway Road) and not two.

  The current separation to the strip is such that even the Squirrel Glider, known to occur in the locality, would not be able to get access to this vegetation by gliding.

  Both the short and long-term impact of habitat removal will be the removal of this stepping-stone connectivity available for birds and bats. In consideration to threatened entities recorded or with potential to occur, such removal would only be considered an impact if hollows are utilised by bats for roosting, which has not been

demonstrated. This is should more so be considered as an impact of habitat removal than an impact on connectivity, as local area foraging and movements by threatened bats and birds are likely to persist with little behavioural change in the population scale.

- *Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development).*

  This has been assessed in detail according to the criteria outlined in Sections 6.1.4 and 8.3.4 of the BAM, and with consideration to avoidance and minimising impacts as outlined in Section 7.2 of the BAM:

  The existing dam will be removed. Potential hydrological and water quality of overland flow south to Swamp Sclerophyll Forest vegetation may be impacted by the proposal.

  The key threatened entities likely to utilise or depend on the dam are recorded threatened microbats Large Bent-winged Bat, Little Bent-winged Bat, Eastern Coastal Free-tailed Bat and Southern Myotis. Insect activity is often greater over such open water bodies which may also be utilised as a drinking resource.

  Of these species, Southern Myotis would no doubt be specifically utilising this habitat feature for concentrated foraging on prey species above and just below the water surface. Impacts on this constructed habitat resource has not been avoided, minimised or otherwise offset. Hollows adjacent to the open water habitat are also proposed for removal which may be suitable for roosting by Southern Myotis.

  Other open water habitat suitable for foraging by Southern Myotis (out to 1 km from the study area) including other local dams and the lower reaches of Karignan Creek to Chain Valley Bay, are shown and a light yellow area (dams) or line (creek) shade on Figure 5.2.

  Swamp Sclerophyll Forest is dependent on soil that is waterlogged or periodically inundated. As such, all hydrological inputs into the EEC, relating to flooding regime and overland flow, are likely to influence its current distribution within the site. Given the largely flat nature of the site and restriction of the majority of the EEC to below the 1 in 100 year flood level, it is reasonable to infer that the extent of the flood plain and the flooding regime is of most importance for the persistence of the EEC vegetation within the site. However, the flooding regime will not be impacted by the proposal as no drainage or major elevation changes are proposed. Overland flow from rain runoff, even though of less importance to the EEC than flooding regime, is the key hydrological process of interest here as it may be impacted by the proposal through increased volume and velocity of runoff, and higher sediment and nutrient loads.

  The Final Determination for Swamp Sclerophyll Forest (NSW Scientific Committee 2011) states that the composition of the EEC “is primarily determined by the frequency and duration of waterlogging and the texture, salinity, nutrient and moisture content of the soil, and latitude”. Changes to hydrological regime is listed as a key threatening process for this EEC in BioNet, and can alter the composition and structure of the understorey of this EEC. Changes to hydrological regimes include increased and decreased periods of inundation and changes to salinity. As stated above, overland flow is likely to be of less importance than flood regime for the EEC within the study area. Changes in overland flow hydrology such as

increased volume and velocity of runoff, and higher sediment and nutrient loads are likely to have importance in relation to understorey composition and prevalence of weed species.

If unmitigated, the proposal could lead to a long-term increase in volume and velocity of water entering the EEC indefinitely. This would be caused by the construction of hard surfaces including internal roads, driveways and buildings that would create more surface runoff during rainfall events. It is expected that these impacts will be avoided through appropriate stormwater management that will divert stormwater into the proposed sedimentation basin, such that hydrological process in the Swamp Sclerophyll Community may persist under natural scenarios.

If unmitigated, the proposal could lead to a short-term increase in sediment and nutrient loads during the construction phase through exposure and disturbance of soil through vegetation clearance and excavation. This could lead to higher weed abundance in the EEC. Appropriate erosion and sediment control measures are to be undertaken to avoid these impacts. Stormwater management including the proposed sedimentation basin will further prevent sediment and nutrient loads entering the EEC. Implementation of the VMP in the conservation areas will allow the control of weed species.

BioNet list several threats to Swamp Sclerophyll Forest, of which the following are relevant to the potential hydrological changes:

- Changes to hydrological regimes. (e.g. increased and decreased periods of inundation and changes to salinity). These include draining associated with ditching, levees and dykes; infill, altered inundation conditions.
- Changes in species diversity, soil chemistry, fire frequency, vegetation structure and loss of ecological function caused by weeds. This includes woody weeds (e.g. groundsel bush, lantana, camphor laurel and bitou bush), Exotic vines & scramblers, Invasive grasses & other weeds (including aquatics).
- Pollution (including herbicide, pesticides, fertilisers) & sedimentation from runoff.

Impacts on hydrological processes influencing the extent and composition of Swamp Sclerophyll Forest are able to be avoided or mitigated by appropriate stormwater management, and erosion and sediment control measures. In addition, the VMP will detail management actions to mitigate any residual indirect impacts including weed establishment.

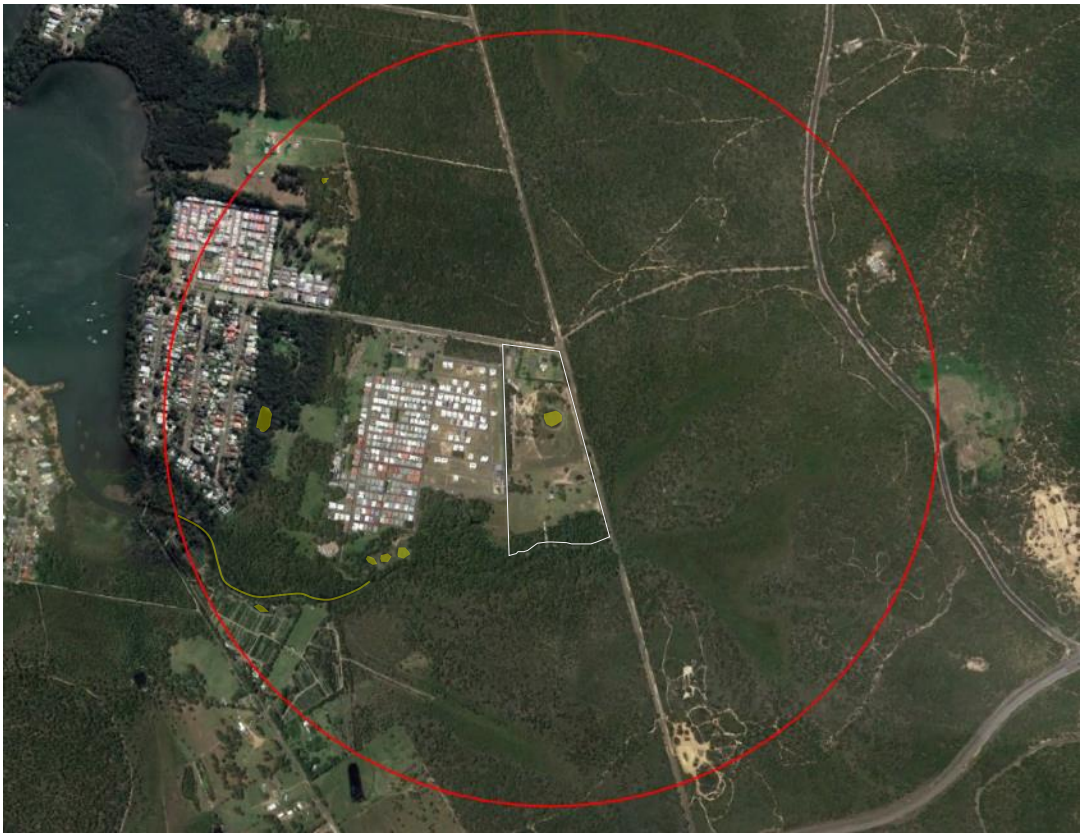


Figure 5.2 – Open water habitat within 1 km

- *Vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community*

  Figure 1.7 shows the current proposed masterplan layout associated with the rezoning. The proposed internal road network includes a road setback off the proposed E2 conservationa area of 20 m. Considerations to the presence of a Masked Owl breeding area nearby to the south within the proposed conservation lands, has prompted a need for roadside fencing in the south-western extent. This fencing and related mitigation measures is shown on Figure 6.1.

  The fencing is not specifically to prevent vehicle strike, but rather to reduce the impacts of lighting spill-over and noise into the breeding area habitat, particularly vehicle headlights driving south on the internal road. The fencing has therefore been placed close to the road in this area. Other options for fencing are described in Section 6.2.

  As Masked Owls are specialist hunters of terrestrial prey and forage off the ground they have been identified in the Recovery Plan for Large Forest Owls (DEC 2006) as being susceptible to vehicle collisions in some areas. A vehicle speed restriction of 10 km/hr will be imposed on the internal roads and therefore collision is not an expected impact of high concern. The fencing will however reduce this potential for both the Masked Owls and other birds.

  Swift Parrot has also been identified as susceptible to collision (*Pfennigwerth* 2008) but more so from flight into reflective windows. The roadside fencing will nonetheless also prompt birds to fly across the road towards the winter flowering habitats at a higher altitude.

No threatened terrestrial mammals or reptiles are expected to utilise the adjacent habitats such that they will be potential impacted by vehicle collision.

Wallum Froglet is known to the immediate locality but no threatened frogs are expected to utilise the riparian habitats within the southern study area as core breeding habitat (as indicated by survey) and are therefore also not as likely to be impacted by vehicle collision within the site itself. Wallum Froglet is however known to breed in more suitable habitats across Chain Valley Bay Road to the nearby south-east, therefore increased traffic as a result of the proposal will occur along this main access road.

The bottom of Figure 5.3 shows a nearby record of Wallum Froglet as well as indicative locations of wet heath on the aerial photograph. Many other records of Wallum Froglet also occur in the surrounding locality in these similar finer and darker vegetation areas indicating wet heath habitat as seen on the top view of Figure 5.3.

Figure 5.3 – Wallum Froglet nearby records & habitat - locality (above), close by (below)

Taking into consideration mobility, abundance and range, there is a likelihood of Wallum Froglet dispersing from local breeding areas during ideal wet weather periods and subsequently at risk of vehicle strike along Chain Valley Road. This potential is currently present from cars accessing the existing residences in Chain Valley Bay as the main access road. The traffic along this road will increase to service the proposed development. It will provide up to an additional 20% traffic load and subsequent potential to impact on individuals dispersing in this direction.

Vehicle strike rates on Wallum Froglet together with another threatened frog species (Wallum Sedge Frog) was studied by *Goldingay & Taylor* (2006) along two 100 m sections of a road that traverses known frog habitat near Lennox Head, in north-eastern New South Wales. This documented numerous (over 1000 counted over 13 mornings) frog deaths from vehicle collision during suitable conditions for movement. Whilst the population dynamics, habitat quality, distance from road and vehicle activity on roads varies between all sites, the study does demonstrate the species (and other frogs) susceptibility to impact from roads.

Where Wallum Froglet disperse from the nearby breeding areas onto Chain Valley Bay Road, these frogs are not likely to make successful passage to other potential nearby breeding areas in this direction anyway. The consequences of any increase vehicle collision potential along this road is also not likely to reduce the viability of any local breeding areas.

5.3.2 Direct impacts

The other direct impacts of the proposal within the subject land are considered as:

- Removal of 0.45 ha of PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast (good)
- Removal of 0.72 ha of PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast (good)
- Removal of 5.95 ha of derived grassland dominated by exotic grasses
- Subsequent removal of threatened fauna species foraging habitat including:
    a) Impact on 0.03 ha of grassland forming part of the Mapped Important Habitat Areas for Swift Parrot which does not include any winter flowering Swamp Mahogany trees.
    b) Seasonal flowering resources for other nectarivore threatened species with potential to occur such as Little Lorikeet and Grey-headed Flying-fox.
    c) Seeding *Allocasuarina* trees for Glossy Black-Cockatoo
    d) Air space and prey species habitat for recorded microbats Eastern Coastal Free-tailed Bat, Large Bent-winged Bat, Little Bent-winged Bat and Southern Myotis.
- Removal of hollows suitable for recorded threatened species.
- Removal of dead trees for perching use by raptors.

5.3.3 Indirect impacts

The potential indirect impacts of the proposal are considered as:

- Increased potential for human disruption of Masked Owl activity and low potential for vehicle strike close to the southern foraging fringe.
- Edge effects such as weed incursions into the adjacent remaining non-certified natural habitat areas
- Reduced cross-site movements by small bird species such as passerines, and arboreal mammals.

- Increased presence of visiting dogs and cats and subsequent impacts on adjacent native wildlife within the retained natural habitat areas.
- Increased spill-over from noise, activity, scent and lighting effects into the adjacent quality natural habitat areas.
- Increased traffic along Chain Valley Bay Road and subsequent potential impacts on terrestrial fauna attempting passage.
- Increased soil nutrients from changes to runoff that may provide further opportunities for weed plumes.
- Concentrated stormwater runoff from solid surfaces and subsequent increased flows.

Consideration of offsetting indirect impacts:
It is considered that the re-design of the proposal and implementation of the TEC buffer and VMP works will avoid indirect impacts or minimise them such that they are negligible. The TEC vegetation already is exposed to edge effects along the current northern vegetation boundary and the proposal will not substantially increase disturbance along this edge, nor create new edges through direct impacts. The existing land use for livestock and horses, which contributes to the current edge effects on the TEC through input of nutrients and weed seed from dung, and silt from soil disturbance, will cease under the proposal. As such, offsetting of any residual indirect impacts is not considered appropriate or necessary.

5.3.4 Cumulative impacts

The potential cumulative impacts (combined results of past, current and future activities) of the proposal are considered as:

- Cumulative loss of PCT 1636 – Scribbly Gum – Red Bloodwood – Angophora inopina heathy woodland on lowlands of the Central Coast
- Increased risk of weed invasion and fungal mobilisation or infections
- Increased varied human presence and activity within the remaining natural habitat areas of the adjacent bushland remnant.
- Edge effects from inappropriate use of remaining native vegetation areas such as additional clearing, dumping of materials, dumping of faecal, food or general waste and building refuse.

5.3.5 Serious & Irreversible Impacts (SAIIs)

An impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community most at risk of extinction. Threatened species and communities that are potential for serious and irreversible impacts are outlined in Appendix 2 of *Guidance to assist a decision-maker to determine a serious and irreversible impact* (OEH 2017). The principles for determining serious and irreversible impacts are set out under Section 6.7.2 of the *BC Reg*.

Candidate SAII entities recorded or with potential to occur within the study area include:

Table 5.2 – Candidate SAII species

Species / TEC (Scientific name)	Species (Common name)	*BC Act*	Potential to occur
Miniopterus schreibersii subsp. *oceanensis*	Large Bent-winged Bat	V	Recorded
Miniopterus australis	Little Bent-winged Bat	V	Recorded
Lathamus discolor	Swift parrot	E	yes
Anthochaera phrygia	Regent honeyeater	CE	Yes (low)

The SAII assessment provisions for threatened species are outlined under Section 9.1.2 of the BAM (2020) and have been applied to the recorded Large Bent-winged Bat and Little Bent-winged Bat within Appendix 2 of this report. The study area does also contribute to Important Mapped Areas for Swift Parrot and therefore SAII assessment provisions has also been applied to this species in Appendix 2. This assessment has concluded that the proposal will not likely cause a SAII on these species.

The study area does not contribute to any Important Mapped Areas for Regent Honeyeater and therefore no SAII is considered likely for these species.

5.4 Vegetation connectivity and habitat corridors

The Wildlife Corridors Strategy – Field Evaluation of Linkage (Payne 2002) identified regional and subregional corridors of significance within the former Wyong Shire. Section 7 of the draft Wyong Conservation Strategy (2003) indicates that Wyong Shire Council has conducted mapping and analysis based on the work by Payne and others depicting future wildlife corridors. This is provided in the North Wyong Shire Structure Plan (NWSSP 2012). It should be noted that whilst draft Wyong Conservation Strategy is widely used, it was never formally adopted by Council. These structure plans are also based primarily on desktop assessments with an overlay of broad-scale layers that often do not have a high degree of accuracy.

The natural existing connective vegetation within the study area is confined to the far southern portions which is almost entirely retained within the proposed E2 area. This area forms part of the regional wildlife pathway identified in the Wyong Wildlife Corridors Strategy (2002).

Some small patches of remnant trees occur within the remaining cleared and managed areas of the site, as well as a narrow strip of good quality natural vegetation along the western boundary. Whilst containing natural hollows and good quality internal connectivity through these middle reaches, this strip does not link to any contiguous habitat.

With consideration to local threatened fauna, this western strip does not likely provide current connectivity for gliders as the southern and north limits have large separations to natural vegetation both within and beyond the study area. This internal habitat also is not recognised for its connectivity values by the Wyong Wildlife Corridors Strategy (2002). Refer to Figure 5.4 for a visual representation of what is described above and the local connectivity values surrounding the study area.

The proposed development will remove the internal trees within the site as well as the western strip of PCT 1636_good vegetation. The current surrounding connectivity on the larger scale and the contributions of the southern proposed E2 area will be retained. Therefore all current quality and terrestrial connectivity options will remain.

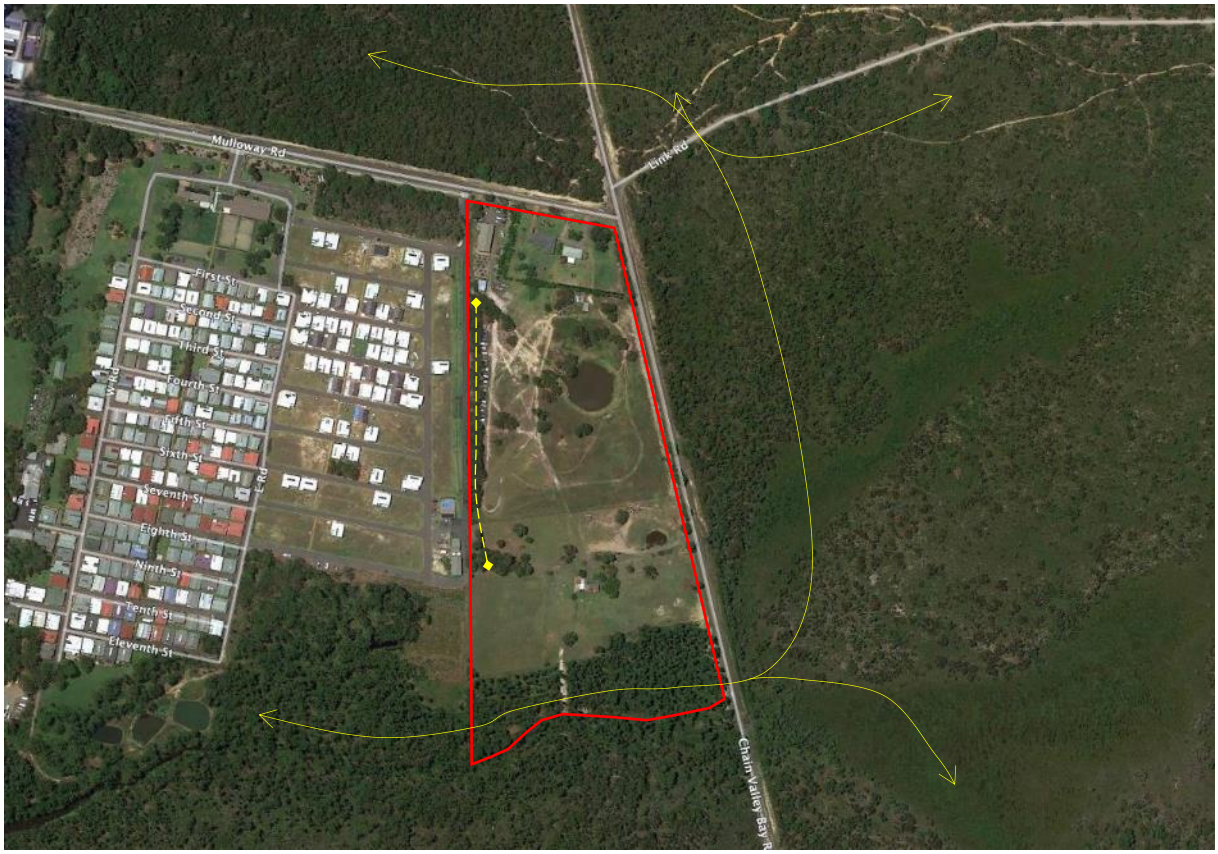


Figure 5.4 – Local connectivity

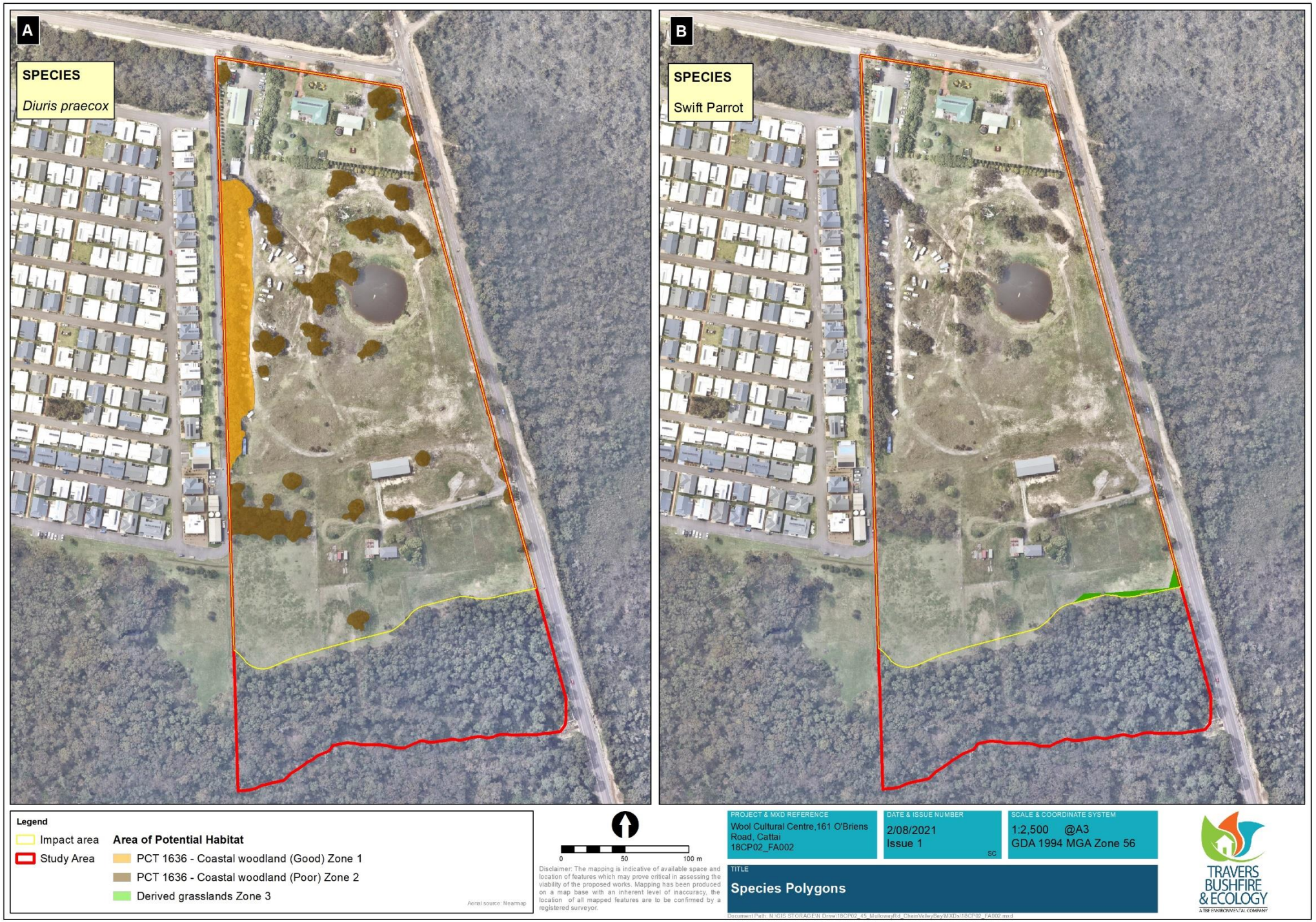


Figure 5.5 – Species credit species polygons (*Diuris praecox* & Swift Parrot)

Figure 5.6 – Species credit species polygons (Southern Myotis, Squirrel Glider & Masked Owl)

Conclusion 6

This BCAR has been prepared for a proposed biodiversity certification to account for future impacts on biodiversity caused by proposed re-zoning, subdivision and development within Lot 5 DP 1228880, at 45 Mulloway Drive, Chain Valley Bay.

Ecological survey and assessment has been undertaken in accordance with relevant legislation including the *EPA Act*, the *BC Act*, the commonwealth *EPBC Act* and the *FM Act*.

6.1 Legislative compliance

In respect of matters required to be considered under the *EP&A Act* and relating to the species / provisions of the *BC Act*, Five (5) threatened fauna species were recorded present during survey including Masked Owl (*Tyto novaehollandiae*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*), Little Bent-winged Bat (*Miniopterus australis*), Eastern-coastal Freetail Bat (*Micronomus norfolkensis*) and Southern Myotis (*Myotis macropus*). The Eastern Coastal Free-tailed Bat was recorded to a 'probable' level of certainty. No threatened flora species, and one (1) threatened ecological community (TEC), *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South-east Corner Bioregions,* were recorded within the subject land.

Offsetting under the Biodiversity Offsets Scheme (BOS) is required for the proposal as:

- The study area is located on lands mapped as Biodiversity Values Land.
- The proposed clearing of native vegetation is greater than the area clearing threshold of 1 ha.

The proposal will also not cause any Serious or Irreversible Impacts (SAII) on threatened biodiversity most at risk of extinction.

A biodiversity credit assessment has been prepared as part of this BCAR.

As an outcome of the SEPP (Koala Habitat Protection) 2020 assessment a Koala Plan of Management is not required.

In respect of matters required to be considered under the *EPBC Act*, no threatened fauna species, one (1) protected migratory bird species Black-faced Monarch (*Monarcha melanopsis*), no threatened flora species and no threatened ecological communities listed under this Act were recorded within the study area. The Black-faced Monarch was recorded only to a 'possible' level of certainty.

The proposal was not considered to have a significant impact on or be constrained by matters of national environmental significance. As such a referral to Department of Agriculture, Water and the Environment is not required.

In respect of matters relative to the *FM Act*, no suitable habitat for threatened marine or aquatic species was observed within the subject land.

6.2 Mitigation measures

The following mitigation measures in Table 6.1 are recommended to avoid, minimise or ameliorate the above potential ecological impacts, address threatening processes and to guide a more positive ecological outcome for threatened species and their associated habitats.

Table 6.1 – Measures to mitigate & manage impacts

Action / Technique	Outcome	Timing / Frequency	Responsibility
Prepare a **Vegetation Management Plan (VMP)** to identify mitigation actions and establish an E2 conservation zone within the site:			
(a) Protection and conservation of SSF to the south of the development footprint. • Limit access to remnant E2 zoned vegetation by placement of permanent fencing. • Prioritised weed control. • Standard *Phytophthora cinnamomi* protocol applies to the cleaning of all plant, equipment, hand tools and work boots prior to delivery onsite to ensure that there is no loose soil or vegetation material caught under or on the equipment and within the tread of vehicle tyres. Any equipment onsite found to contain soil or vegetation material is to be cleaned in a quarantined work area or wash station and treated with fungicides.	Prevent indirect impacts on E2 conserved habitats, including from human disturbance, domestic pets and dumping. Reduce prevalence of weeds.	Prior to any clearing works. Ongoing	Project Ecologist as guided by the VMP
(b) Protection of Masked Owl breeding pair in adjacent habitat to the south: • Protect roost and nest tree buffers by placement of solid fencing along the south-western road edge to provide a screen to prevent vehicle head-light, streetlight, housing light and related noise spill-over. Provide 5-strand wire fencing along the rest of this edge to permit ongoing foraging. • Avoiding vehicle collisions along the forested edge where the species likely forages by planting a hedging along the road edge	Protection of indirect impacts on Masked Owl nest and roost trees. Minimisation of risk of vehicle collision on internal road. Reduce spill over of noise and lighting. Reduce human disturbance.	In Place prior to any road lighting or residential dwellings. 10 km/hr speed restrictions on MHE internal roads. Major construction works, including sedimentation dam and internal roads, are all to be undertaken outside of the Masked Owl	Project Ecologist as guided by the VMP

Action / Technique	Outcome	Timing / Frequency	Responsibility
and setback from the vegetated edge. Internal roads will have low speed limits and low traffic volume. • Lighting baffles on road lights to direct light down and away from E2 areas.		breeding period (May-August).	
(c) Sediment and erosion control measures in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom 2004) to minimise impact of possible sedimentation to local drainage lines.	Maintain integrity of E2 habitat and natural topsoil soil by preventing deposition	Prior to any clearing works. Ongoing during all exposed soil stages until landscaping is completed	Project Ecologist / Contractors
(d) Temporary fencing - Where they adjoin the development areas, the boundaries of the conservation areas shall be clearly marked out on-site to ensure their protection. All areas of natural vegetation retention shall be protected by fencing, prior to construction, to ensure that these areas are not damaged during the construction phase.	Maintain integrity of E2 habitat during construction of roads, sedimentation basin, buildings and infrastructure	Prior to Construction / habitat clearance	Project Ecologist / Contractors
(e) Construction activities are to be intermittently supervised on-site and monitored. All staff involved with the development shall undergo an induction and training program to reinforce the ecological and environmental objectives of the development.	Ensure that the recommendations of the BCAR are implemented.	Prior to and during habitat clearance and construction of services	Project Ecologist
(f) Undertake water quality testing along Karignan Creek to monitor for any increase in nutrient or sediment.	Ensure no indirect impacts on adjacent water quality or quantity	Prior to and during habitat clearance and construction	Project Ecologist
(g) Protection of Swift Parrots and their winter flowering habitat: • No Swamp Mahogany tree will be impacted by the proposal, this is to be enforced through providing temporary protection fencing during construction, particularly of the adjacent dam. • Further potential foraging habitat will be provided by planting of Swamp Mahogany and Spotted Gum trees within the southern APZ / habitat buffer area. This will benefit both Swift Parrot and	No net loss of wintering flowering habitat. Improved presence of winter flowering potential habitat. Reduced potential for injury/death via collisions.	Plantings during landscaping at any time. Windows during design stage and installation.	Project Ecologist / Proponent / Contractors

Action / Technique	Outcome	Timing / Frequency	Responsibility
other threatened nectivorous threatened species with potential to occur. These works are to then be incorporated into the VMP. • Fencing along the road edge is proposed to protect Masked Owl habitat to the south. This may also in turn provide a reduced potential for vehicle collisions at this location adjacent to Swamp Mahogany habitat, as this would encourage the birds to approach the food source at a higher altitude. Colorbond is proposed but other alternatives are acceptable. Wire mesh fencing is to be avoided here or covered with shade cloth or planted and trained vines. Mesh fencing can also be covered with hedging, netting, mesh or other visual noise. Hedging is to be provided on the road side of the fence, for visual amenity. This may continue beyond the fenced area but still along the outer edge of the road for additional effect. • Buildings to be located adjacent to the potential swift parrot habitat and flyways to the south should seek to minimise large expanses of glazing as well as glass reflectivity and transparency. For example, reduced- or low-reflectivity glass (0–10% reflectivity) should be used wherever possible and be integrated into the overall building design. Furthermore, install windows adjacent to habitat at an angle (i.e. angled in at their base) such that the glass pane reflects the ground instead of the surrounding habitat and sky in the birds' direct line of sight. Angles become effective at a minimum of 20 degrees from vertical, although 40-degree angles are known to be more effective. Visual noise or muting window reflection may also be used to prevent the appearance of windows as providing flying space beyond. Clear glass fencing, panelling or balustrading is to be avoided.			
(h) Prior to any habitat removal, a comprehensive search for fauna and habitat is to be undertaken to relocate any terrestrial individuals and identify any important nesting to be protected until fledging.	Reduce potential for impact on native species	Immediately prior to land clearance	Project Ecologist

Action / Technique	Outcome	Timing / Frequency	Responsibility
(i) Dam dewatering is to be undertaken in accordance with appropriate protocols to ensure consideration is given to all potentially impacted aquatic fauna within the dam (eg eels / turtles) and breeding water birds as well as species potentially indirectly impacted elsewhere. Protocols are to include frog hygiene, relocating aquatic fauna to recipient sites and appropriate euthanasia of Gambusia.	Reduce potential for direct impact on aquatic species present and indirect impacts on aquatic species elsewhere	Prior to land clearance	Project Ecologist
(j) Appropriate feral / pest terrestrial species management. eg rabbits.	Reduce potential for impact on native species by feral animals	Prior to land clearance	Project Ecologist
(k) Management of hollows and hollow-dependent fauna: • The felling of hollow-bearing trees is to be conducted under the supervision of a fauna ecologist to ensure appropriate animal welfare procedures are taken, particularly for threatened species. Hollows of high quality or with fauna recorded residing within should be dismantled for relocation and all hollows should be inspected for occupation, signs of previous activity and potential for reuse.	Protection of hollow-dependent wildlife	At time of removal	Project Ecologist

Action / Technique	Outcome	Timing / Frequency	Responsibility
• Subsequent hollows of retention value are to be relocated to nearby conservation areas. If these are placed as on ground habitat and are not reattached to a new recipient tree then they are to be replaced with appropriately sized nest boxes affixed to a retained tree. All hollow sections considered suitable for Squirrel Glider should where possible be recovered and prepared for placement into an appropriate retained tree.	Maintain quality denning / hollow shelter opportunities	At time of removal	Project Ecologist
• Constructed nest boxes should as priority target recorded hollow-dependent threatened species (and their prey species). Boxes should be constructed all of weatherproof timber (marine ply), fasteners and external paint and appropriately affixed to a recipient tree under the guidance of a fauna ecologist.	Protection of hollow-dependent wildlife	Prior to hollow removal	Project Ecologist
• If a threatened species is found to be occupying the hollow at the time of removal then this hollow section is to be reattached to a recipient tree within the nearby conservation areas as selected and directed by the fauna ecologist. The welfare and temporary holding of the residing animal(s) is at the discretion of the fauna ecologist.	Priority protection of hollow-dependent threatened species	At time of removal	Project Ecologist
• The relocated hollow section and nest boxes should be well secured in the recipient tree in a manner that will not compromise the current or future health of that tree.	Ensure hollow integrity is maintained	Time of installation	Project Ecologist
• Monitoring of nest boxes and relocated hollows	Ensure hollow integrity is maintained	Each year for 5 years	Project Ecologist
(l) Management of any other displaced fauna	Prevent direct impacts on nesting and terrestrial native fauna species	Prior to and during habitat removal / Adaptive management required	Project Ecologist
(m) If any fauna species, a nest or roost is located during development works, then works should cease until safe relocation can be advised by a contact fauna ecologist	Prevent direct impacts on nesting and terrestrial native fauna species	At time of removal / Adaptive management required	Project Ecologist / Contractors
Other mitigation measures: Design, construction, development and residential control measures			

Action / Technique	Outcome	Timing / Frequency	Responsibility
(n) Appropriate stormwater management design to avoid hydrological changes in surface water inputs into the southern TEC vegetation and associated habitat	Prevent changes in hydrological processes affecting TEC vegetation and threatened species habitat	Subdivision DA stage	Proponent
(o) Condition on residents restricting cat ownership	Prevent domestic cat predation on threatened fauna, particularly Swift Parrot	Subdivision DA stage	Proponent and council

Restoration Performance Targets

The following restoration performance targets are to be audited and compliance certificate issued by the project ecologist demonstrating satisfactory completion of the works in the Vegetation Management Plan.

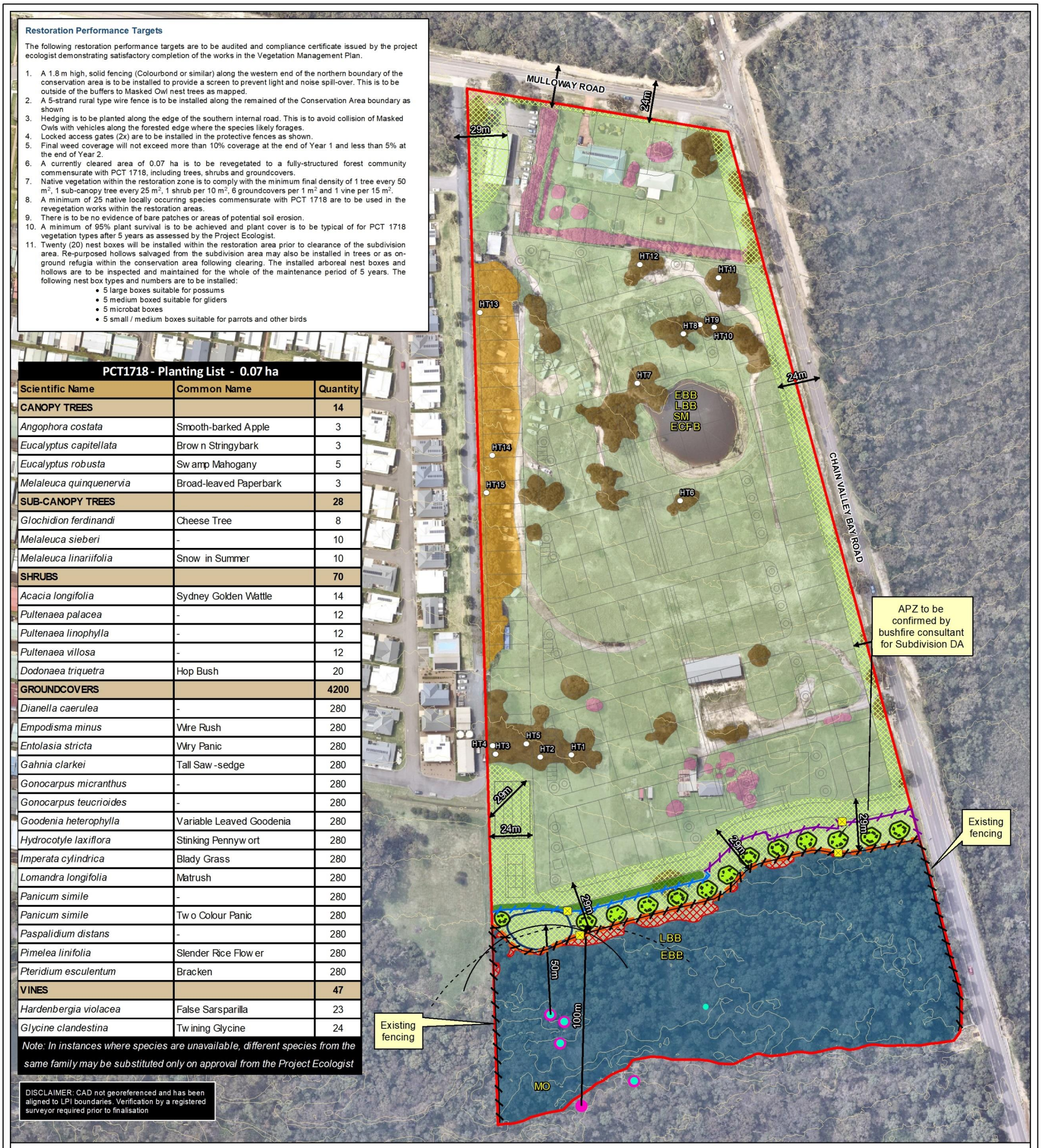
1. A 1.8 m high, solid fencing (Colourbond or similar) along the western end of the northern boundary of the conservation area is to be installed to provide a screen to prevent light and noise spill-over. This is to be outside of the buffers to Masked Owl nest trees as mapped.
2. A 5-strand rural type wire fence is to be installed along the remained of the Conservation Area boundary as shown
3. Hedging is to be planted along the edge of the southern internal road. This is to avoid collision of Masked Owls with vehicles along the forested edge where the species likely forages.
4. Locked access gates (2x) are to be installed in the protective fences as shown.
5. Final weed coverage will not exceed more than 10% coverage at the end of Year 1 and less than 5% at the end of Year 2.
6. A currently cleared area of 0.07 ha is to be revegetated to a fully-structured forest community commensurate with PCT 1718, including trees, shrubs and groundcovers.
7. Native vegetation within the restoration zone is to comply with the minimum final density of 1 tree every 50 m^2, 1 sub-canopy tree every 25 m^2, 1 shrub per 10 m^2, 6 groundcovers per 1 m^2 and 1 vine per 15 m^2.
8. A minimum of 25 native locally occurring species commensurate with PCT 1718 are to be used in the revegetation works within the restoration areas.
9. There is to be no evidence of bare patches or areas of potential soil erosion.
10. A minimum of 95% plant survival is to be achieved and plant cover is to be typical of for PCT 1718 vegetation types after 5 years as assessed by the Project Ecologist.
11. Twenty (20) nest boxes will be installed within the restoration area prior to clearance of the subdivision area. Re-purposed hollows salvaged from the subdivision area may also be installed in trees or as on-ground refugia within the conservation area following clearing. The installed arboreal nest boxes and hollows are to be inspected and maintained for the whole of the maintenance period of 5 years. The following nest box types and numbers are to be installed:
    - 5 large boxes suitable for possums
    - 5 medium boxed suitable for gliders
    - 5 microbat boxes
    - 5 small / medium boxes suitable for parrots and other birds

PCT1718 - Planting List - 0.07 ha

Scientific Name	Common Name	Quantity
CANOPY TREES		**14**
Angophora costata	Smooth-barked Apple	3
Eucalyptus capitellata	Brow n Stringybark	3
Eucalyptus robusta	Sw amp Mahogany	5
Melaleuca quinquenervia	Broad-leaved Paperbark	3
SUB-CANOPY TREES		**28**
Glochidion ferdinandi	Cheese Tree	8
Melaleuca sieberi	-	10
Melaleuca linariifolia	Snow in Summer	10
SHRUBS		**70**
Acacia longifolia	Sydney Golden Wattle	14
Pultenaea palacea	-	12
Pultenaea linophylla	-	12
Pultenaea villosa	-	12
Dodonaea triquetra	Hop Bush	20
GROUNDCOVERS		**4200**
Dianella caerulea	-	280
Empodisma minus	Wire Rush	280
Entolasia stricta	Wiry Panic	280
Gahnia clarkei	Tall Saw-sedge	280
Gonocarpus micranthus	-	280
Gonocarpus teucrioides	-	280
Goodenia heterophylla	Variable Leaved Goodenia	280
Hydrocotyle laxiflora	Stinking Pennyw ort	280
Imperata cylindrica	Blady Grass	280
Lomandra longifolia	Matrush	280
Panicum simile	-	280
Panicum simile	Tw o Colour Panic	280
Paspalidium distans	-	280
Pimelea linifolia	Slender Rice Flow er	280
Pteridium esculentum	Bracken	280
VINES		**47**
Hardenbergia violacea	False Sarsparilla	23
Glycine clandestina	Tw ining Glycine	24

Note: In instances where species are unavailable, different species from the same family may be substituted only on approval from the Project Ecologist

DISCLAIMER: CAD not georeferenced and has been aligned to LPI boundaries. Verification by a registered surveyor required prior to finalisation



Aerial source: Nearmap

Legend

- Study Area
- Contour (Source: LiDAR)
- Detention basin
- Approximate boundary for biocertification

Fauna Survey Results (2019)

- MO Masked Owl
- LBB Little Bent-winged Bat
- SM Southern Myotis
- EBB Large Bent-winged Bat
- ECFB Eastern Coastal Free-tailed Bat

- Habitat tree

Significant Hollow-bearing Trees

- Suitable for Squirrel Glider
- Suitable for Large Forest Owl
- Indicative roost tree buffer
- Indicative nest tree buffer

- N Nest box (20)
- Locked gate (4)
- Fully restructured vegetation (0.07ha)
- Screening shrubs/hedge
- Swamp Mahogany tree plantings (13 trees)

Permanent Protective Fencing

- 5 strand wire fence (747m)
- Post and rail fence (185m)
- Solid fencing-colourbond or similar (76m)
- Asset Protection Zone (APZ)

Plant Community Types (PCTs)

- Zone 1: PCT 1636 – Scribbly Gum – Red Bloodwood – *Angophora inopina* heathy woodland on lowlands of the Central Coast (good - 0.45ha)
- Zone 2: PCT 1636 – Scribbly Gum – Red Bloodwood – *Angophora inopina* heathy woodland on lowlands of the Central Coast (poor)(0.72ha)
- Zone 3: Derived grasslands (6.02ha)
- PCT 1718 Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (good - 2.45ha)
- Exotic trees (0.24ha)

TRAVERS BUSHFIRE & ECOLOGY
A TBE ENVIRONMENTAL COMPANY

PROJECT & MXD REFERENCE	DATE & ISSUE NUMBER	SCALE & COORDINATE SYSTEM
45 Mulloway Rd, ChainValley Bay 18CP02_VMP001	3/08/2021 Issue 1 SC	1:2,000 @ A3 GDA 1994 MGA Zone 56

0 50 100 m

TITLE

Concept Master VMP

Disclaimer: The mapping is indicative of available space and location of features which may prove critical in assessing the viability of the proposed works. Mapping has been produced on a map base with an inherent level of inaccuracy, the location of all mapped features are to be confirmed by a registered surveyor.

Document Path: N:\GIS STORAGE\N Drive\18CP02_45_MullowayRd_ChainValleyBay\MXDs\18CP02_VMP001.mxd

Figure 6.1 – Concept Master VMP – Overview of mitigation measures

6.3 Biodiversity credit requirements

6.3.1 Impacts requiring offset

The following impacts will require offsetting:

- 7.1 ha* of PCT 1636
- loss of habitat for threatened species, including species credits for *Diuris praecox*, Masked Owl, Swift Parrot, Southern Myotis and Squirrel Glider.

Locations of the abovementioned communities within the subject land are shown on Figure 2.3. Species polygons used to determine species credit requirements are mapped on Figure 5.5 and Figure 5.6.

*Note: the BAM calculator rounds impact requirements to the nearest 0.1 ha, hence the discrepancy with the values stated elsewhere in the BCAR.

6.3.2 Impacts not requiring offset

The following impacts do not require offset:

- Impacts on non-native vegetation
- Removal of the constructed dam
- Indirect impacts on remaining native vegetation areas as outlined in Section 5.3.3.

All areas of native vegetation impact will require offsetting and have been accounted for in the BAM calculator. All of the zones had a vegetation integrity score above the minimum requirements.

6.3.3 Areas not requiring assessment

Native vegetation that has not been directly impacted by this proposal, both within the study area and beyond, do not require credit assessment.

BAM Credit Results

7

7.1 Ecosystem credits and species credits

Ecosystem credits and species credits that measure the impact of the development on biodiversity values have been calculated, assuming full removal of vegetation within the subject land. Thus the future vegetation integrity score will be 0 for all Zones (see Section 3.1.5).

Habitat suitability for credit species has been considered in Section 4.

Ecosystem credits for plant community types (PCTs), ecological communities and threatened species habitat is shown below in Table 7.1. Species credits for threatened species are shown in Table 7.2.

Table 7.1 – Requirement for ecosystem credits

Zone	Veg. zone name	Veg. integrity loss	Area (ha)	Sensitivity to gain	Biodiversity risk weighting	Potential SAII	Ecosystem credits
1	1636_good	64.4	0.45	High	1.75	no	13
2	1636_poor	58.8	0.72	High	1.75	no	19
4	1636_grassland	4.7	6	High	1.75	no	0
							Subtotal: 32
							Total: 32

Table 7.2 – Requirement for species credits

Veg. zone name	Veg. integrity loss	Area (ha) / count	Biodiversity risk weighting	Potential SAII	Species credits
***Diuris praecox* / Rough Doubletail**					
1636_good	64.4	0.45	1.5	False	11
1636_poor	58.8	0.72	1.5	False	16
					Subtotal: 27
***Lathamus discolor* / Swift Parrot**					
1636_grassland	4.7	0.03	3	True	1
					Subtotal: 1
***Myotis macropus* / Southern Myotis**					
1636_good	64.4	0.45	2	False	14
1636_grassland	4.7	6	2	False	14
1636_poor	58.8	0.72	2	False	21
					Subtotal: 49
***Petaurus norfolcensis* / Squirrel Glider**					

1636_good	64.4	0.45	2	False	14
1636_poor	58.8	0.72	2	False	21
					Subtotal: 35
***Tyto novaehollandiae* / Masked Owl**					
1636_poor	58.8	0.04	2	False	1
					Subtotal: 1

7.2 Ecosystem credit classes

Table 7.3 – Ecosystem credit summary

PCT	TEC	Area (ha)	Credits
PCT 1636	Not a TEC	7.1	32

Table 7.4 – Credit classes for PCT 1636 - Like for like options

Veg. zone	Vegetation Class	Trading group	Containing hollow-bearing trees?	Credits	IBRA Region
1636_good	Sydney Coastal Dry Sclerophyll Forests This includes PCTs: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests - ≥ 50% - < 70% cleared group (including Tier 3 or higher threat status).	Yes	13	Wyong , Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1636_poor	As above	As above	No	19	As above
1636_grassland	As above	As above	No	0	As above

7.3 Species credit classes

Table 7.5 – Species credit summary

Species	Vegetation Zone/s names	Area (ha)	Credits
Diuris praecox / Rough Doubletail	1636_good, 1636_poor	1.2	27
Lathamus discolor / Swift Parrot	1636_grassland	0.03	1
Myotis macropus / Southern Myotis	1636_good, 1636_poor, 1636_grassland	7.1	49
Petaurus norfolcensis / Squirrel Glider	1636_good, 1636_poor	1.2	35
Tyto novaehollandiae / Masked Owl	1636_grassland	0.04	1

All above-listed species need to be offset with the same species but anywhere in NSW.

The pricing of credits can vary greatly over time and it is advised that the proponent use the online Biodiversity Offset Payment Calculator tool to determine the current pricing of credits (https://www.lmbc.nsw.gov.au/offsetpaycalc).

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Threatened & Migratory Species Habitat Assessment

A1

Table A1.1 provides an assessment of potential habitat within the subject land for nationally listed threatened flora species recorded within 10 km on *BioNet* (DPIE) or indicated to have potential habitat present within 10 km on the *EPBC Act* Protected Matters Search Tool (PMST).

Table A 1.1 – Nationally Threatened flora habitat assessment

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Acacia bynoeana DPIE PMST	E1	V	Erect or spreading shrub to 0.3 m high growing in heath and dry sclerophyll open forest on sandy soils. Often associated with disturbed areas such as roadsides. *Distribution limits N-Newcastle S-Berrima.*	x	✓	x	2011	unlikely	✓
Angophora inopina DPIE PMST	V	V	Small tree in open sclerophyll forest growing on deep sandy soils with associated lateritic outcrops. *Distribution limits N-Wyee S-Gorokan with a disjunct population near Karuah.*	x	✓	700 m ENE	✓	✓	✓
Caladenia tessellata DPIE PMST	E1	V	Terrestrial orchid. Clay-loam or sandy soils. LHCCREMS guidelines suggest the species grows in Map Unit 34 – Coastal Sand Wallum Woodland - Heath. Flowers in September – November. *Distribution limits N-Swansea S-south of Eden.*	x	marginal	5 km E	1998	x	x

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Corunastylis sp. Charmhaven DPIE PMST	CE	CE	Terrestrial orchid currently only known from the Wyong Shire of NSW in the Gorokan/Charmhaven area. It occurs within low woodland to heathland with a shrubby understorey and ground layer. Dominants include *Allocasuarina littoralis, Leptospermum juniperinum, Melaleuca nodosa, Callistemon linearis* and *Schoenus brevifolius.* Flowers likely in Feb-Mar.	x	low	x	2017	unlikely	x
Cryptostylis hunteriana DPIE PMST	V	V	Saprophytic orchid. Grows in swamp heath on sandy soils. *Distribution limits N-Gibraltar Range S-south of Eden.*	x	✓	3 km N	2018	low	✓
Cynanchum elegans PMST	E1	E	Climber or twiner to 1 m. Grows in rainforest gullies, scrub & scree slopes. *Distribution limits N-Gloucester S-Wollongong.*	x	x	-	-	x	x
Diuris praecox DPIE PMST	V	V	Terrestrial orchid. Grows in sclerophyll forest near the coast. *Distribution limits N-Nelson Bay S-Ourimbah.*	x	moderate	1 km N & E	2017	low	✓
Eucalyptus camfieldii DPIE PMST	V	V	Stringybark to 10 m high. Grows on coastal shrub heath and woodlands on sandy soils derived from alluviums and Hawkesbury sandstone. *Distribution limits N-Norah Head S-Royal NP.*	x	moderate	4 km E	2007	low	✓
Eucalyptus parramattensis subsp. *decadens* DPIE PMST	V	V	Red gum to 15 m high. Grows in dry open forest on sandy to clay soils often in lowly elevated moist sites. *Distribution limits N-Port Macquarie S-Kurri Kurri.*	x	low	6 km NE	2019	unlikely	✓

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Genoplesium insigne DPIE PMST	E4A	CE	Terrestrial orchid. Found in *Themeda* patches among shrubs and sedges in heathland and forest. *Known from 3 localities in Wyong-Charmhaven area.* Occurs in vegetation dominated by Scribbly Gum, Red Bloodwood, Smooth-barked Apple and Black She-oak at Charmhaven. Flowers Sept-Oct.	x	✓	500 m E	2018	✓	✓
Grevillea parviflora subsp. *parviflora* DPIE PMST	V	V	Open to erect shrub to 1 m. Grows in woodland on sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. *Distribution limits N-Cessnock S-Appin.*	x	moderate	x	2018	unlikely	✓
Melaleuca biconvexa DPIE PMST	V	V	Tall shrub. Grows in wetlands adjoining perennial streams and on the banks of those streams, generally within the geological series known as the Terrigal Formation. *Distribution limits N-Port Macquarie S-Jervis Bay.*	x	x	-	-	x	x
Persoonia hirsuta PMST	E1	E	Erect to decumbent shrub. Grows in dry sclerophyll forest and woodland on Hawkesbury sandstone with infrequent fire histories. *Distribution limits N-Glen Davis S-Hill Top.*	x	x	-	-	x	x
Pterostylis gibbosa PMST	E1	E	Terrestrial orchid which occurs near Wollongong and in Hunter Valley in sclerophyll forest, sometimes with paperbarks.	x	x	-	-	x	x
Rutidosis heterogama DPIE PMST	V	V	Erect herb to 30cm. Grows mostly in heath, often along roadsides. *Distribution limits N-Maclean S-Hunter Valley.*	x	moderate	4 km SE	2015	unlikely	✓
Syzygium paniculatum DPIE PMST	V	V	Small tree. Subtropical and littoral rainforest on sandy soil. *Distribution limits N-Forster S-Jervis Bay.*	x	x	-	-	x	x

Scientific name DATABASE SOURCE1	***BC Act***	***EPBC Act***	**Growth form and habitat requirements** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and / or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Tetratheca juncea DPIE PMST	V	V	Prostrate shrub to 1 m high. Dry sclerophyll forest and heath. *Distribution limits N-Bulahdelah S-Port Jackson.*	x	✓	500 m W	2018	✓	✓
Thelymitra adorata PMST	E4a	CE	Currently known from a few localised occurrences in the area bounded by the towns of Wyong, Warnervale and Wyongah on the New South Wales Central Coast, Occurs from 10-40 m a.s.l. in grassy woodland or occasionally derived grassland in well-drained clay loam or shale derived soils. The vegetation type in which the majority of populations occur (including the largest colony) is a Spotted Gum - Ironbark Forest with a diverse grassy understorey and occasional scattered shrubs.	x	x	-	-	x	x
Thesium australe PMST	V	V	Erect herb to 0.4 m high. Root parasite. Themeda grassland or woodland often damp. *Distribution limits N-Tweed Heads S-south of Eden.*	x	x	-	-	x	x

OEH	- Denotes species listed within 10 km of the subject land on the *Atlas of NSW Wildlife*
EPBC	- Denotes species listed within 10 km of the subject land in the *EPBC Act* habitat search
TBE	- Denotes additional species considered by *Travers bushfire & ecology* to have potential habitat based on regional knowledge and other records
V	- Denotes vulnerable listed species under the relevant Act
E or E1	- Denotes endangered listed species under the relevant Act
E4A or CE	- Denotes critically endangered listed species under the relevant Act
NOTE:	1. This field is not considered if no suitable habitat is present within the subject land 2. 'records' refer to those provided by the *Atlas of NSW Wildlife* 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle

Table A1.2 provides an assessment of potential habitat within the study area for nationally listed threatened fauna species recorded within 10 km on *BioNet* (DPIE) or indicated to have potential habitat present within 10 km on the *EPBC Act* Protected Matters Tool.

Table A 1.2 – Nationally Threatened fauna habitat assessment

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Giant Burrowing Frog *Heleioporus australiacus* PMST	V	V	Inhabits open forests and riparian forests along non-perennial streams, digging burrows into sandy creek banks. *Distribution limit: N-Near Singleton S-South of Eden.*	x	x	-	-	x	x
Green and Golden Bell Frog *Litoria aurea* DPIE PMST	E	V	Prefers the edges of permanent water, streams, swamps, creeks, lagoons, farm dams and ornamental ponds. Often found under debris. *Distribution limit: N-Byron Bay S-South of Eden.*	x	Sub-optimal	x	x	Not likely	x
Littlejohn's Tree Frog *Litoria littlejohni* PMST	V	V	Found in wet and dry sclerophyll forest associated with sandstone outcrops at altitudes 280-1,000 m on eastern slopes of Great Dividing Range. Prefers flowing rocky streams. *Distribution limit: N-Hunter River S-Eden.*	x	x	-	-	x	x

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Australasian Bittern *Botaurus poiciloptilus* EPBC	E	E	Found in or over water of shallow freshwater or brackish wetlands with tall reedbeds, sedges, rushes, cumbungi, lignum and also in ricefields, drains in tussocky paddocks, occasionally saltmarsh, brackish wetlands. *Distribution limit: N-North of Lismore. S- Eden.*	x	x	-	-	x	x
Australian Painted Snipe *Rostratula australis* EPBC	E	E	Most numerous within the Murray-Darling basin and inland Australia within marshes and freshwater wetlands with swampy vegetation. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x
Swift Parrot *Lathamus discolour* DPIE PMST	E	E	Inhabits eucalypt forests and woodlands with winter flowering eucalypts. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	x	✓	✓	✓	✓	✓
Eastern Bristlebird *Dasyornis brachypterus* EPBC	E	E	Coastal woodlands, dense scrubs and heathlands, especially where low heathland borders taller woodland or dense tall tea-tree. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	x	-	-	x	x
Regent Honeyeater *Xanthomyza Phrygia* DPIE PMST	E4A	CE	Found in temperate eucalypt woodland and open forest including forest edges, wooded farmland and urban areas with mature eucalypts. *Distribution limit: N-Urbanville. S-Eden.*	x	✓	x	x	low	✓

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Painted Honeyeater *Grantiella picta* EPBC	V	V	A nomadic bird occurring in low densities within open forest, woodland and scrubland feeding on mistletoe fruits. Inhabits primarily Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. *Distribution limit: N-Boggabilla. S-Albury with greatest occurrences on the inland slopes of the Great Dividing Range.*	x	x	-	-	x	x
Spotted-tailed Quoll *Dasyurus maculatus* DPIE PMST	V	E	Dry and moist open forests containing rock caves, hollow logs or trees. *Distribution limit: N-Mt Warning National Park. S-South of Eden.*	x	✓	✓	✓	✓	✓
Koala *Phascolarctos cinereus* DPIE PMST	V	V	Inhabits both wet and dry eucalypt forest on high nutrient soils containing preferred feed trees. *Distribution limit: N-Tweed Heads. S-South of Eden.*	x	✓	✓	x	unlikely	✓
Greater Glider *Petauroides volans* EPBC	-	V	Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Population density is optimal at elevation levels at 845 m above sea level. Prefer overstorey basal areas in old-growth tree stands. Highest abundance typically in taller, montane, moist eucalypt forests, with relatively old trees and abundant hollows *Distribution limit: N-Border Ranges National Park. S- South of Eden.*	x	Sub-optimal	x	x	Not likely	x

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Long-nosed Potoroo *Potorous tridactylus* EPBC	V	V	Coastal heath and dry and wet sclerophyll forests with a dense understorey. *Distribution limit: N-Mt Warning National Park. S-South of Eden.*	x	x	-	-	x	x
Grey-headed Flying-fox *Pteropus poliocephalus* DPIE PMST	V	V	Found in a variety of habitats including rainforest, mangroves, paperbark swamp, wet and dry open forest and cultivated areas. Forms camps commonly found in gullies and in vegetation with a dense canopy. *Distribution limit: N-Tweed Heads. S-Eden.*	x	✓	✓	✓	✓	✓
Large-eared Pied Bat *Chalinolobus dwyeri* EPBC	V	V	Warm-temperate to subtropical dry sclerophyll forest and woodland. Roosts in caves, tunnels and tree hollows in colonies of up to 30 animals. *Distribution limit: N-Border Ranges National Park. S-Wollongong.*	x	x	-	-	x	x
New Holland Mouse *Pseudomys novaehollandiae* EPBC	-	V	Occurs in heathlands, woodlands, open forest and paperbark swamps and on sandy, loamy or rocky soils. Coastal populations have a marked preference for sandy substrates, a heathy understorey of leguminous shrubs less than 1 m high and sparse ground litter. Recolonise of regenerating burnt areas. *Distribution limit: N-Border Ranges National Park. S-South of Eden.*	x	x	-	-	x	x

Common name ***Scientific name*** Database source	***BC Act***	***EPBC Act***	**Preferred habitat** ***Distribution limit***	**Recorded on site (✓)**	**If not recorded on site**				**Considered for referral assessment (✓)**
					Suitable habitat present (✓)	**Nearby and/or high number of record(s) (✓)** *Notes 1,2 & 3*	**Record(s) from recent years (✓)** *Notes 1,2 & 3*	**Potential to occur**	
Australian Grayling *Prototroctes maraena* EPBC	Part 2, Section 19 – Protected Fish (*FM Act 1994*)	V	Clear, moderate to fast flowing water in the upper reaches of rivers (sometimes to altitudes above 1,000 m). Typically found in gravel bottom pools. Often forming aggregations below barriers to upstream movement (e.g. weirs, waterfalls).	x	x	-	-	x	x

DPIE	Denotes species listed within 10 km of the subject land on the *Atlas of NSW Wildlife*
PMST	Denotes species listed within 10 km of the subject land in the *EPBC Act* habitat search
TBE	Denotes additional species considered by *Travers bushfire & ecology* to have potential habitat based on regional knowledge and other records
V	Denotes vulnerable listed species under the relevant Act
E or E1	Denotes endangered listed species under the relevant Act
E4A or CE	Denotes critically endangered listed species under the relevant Act
NOTE:	1. This field is not considered if no suitable habitat is present within the subject land 2. 'records' refer to those provided by the *Atlas of NSW Wildlife* 3. 'nearby' or 'recent' records are species specific accounting for home range, dispersal ability and life cycle
Unlikely	Represents such a low margin but not enough to 100% rule it one. A significance of impact test is required.
Not likely	Means 0% change of occurring, despite there being potential habitat. A significance of impact test is not applied to these species.

Table A1.3 provides an assessment of potential habitat within the study area for nationally *protected* migratory fauna species recorded within 10 km on the *EPBC Act* Protected Matters Tool. Nationally *threatened* migratory species are considered in Table A1.2.

Table A 1.3 – Migratory fauna habitat assessment

Common name ***Scientific name***	**Preferred habitat** ***Migratory breeding***	**Suitable habitat present (✓)**	**Recorded present (✓)**	**Comments on potential impacts**
Oriental or Horsfield's Cuckoo (*Cuculus optatus*)	It 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.	✓	x	No likely impact
Osprey *Pandion cristatus*	Utilises waterbodies including coastal waters, inlets, lakes, estuaries and offshore islands with a dead tree for perching and feeding. *Distribution Limit: N-Tweed Heads. S-South of Eden.*	x	-	-
White-throated Needletail (*Hirundapus caudacutus*)	Airspace over forests, woodlands, farmlands, plains, lakes, coasts, towns; companies forage often along favoured hilltops and timbered ranges. *Breeds Siberia, Himalayas, east to Japan. Summer migrant to eastern Australia.*	✓	x	No likely impact
Black-faced Monarch (*Monarcha melanopsis*)	Rainforests, eucalypt woodlands; coastal scrubs; damp gullies in rainforest, eucalypt forest; more open woodland when migrating. *Summer breeding migrant to coastal south east Australia, otherwise uncommon*.	✓	✓	An individual was heard at a distance within the southern forest area. No potential breeding or likely foraging habitat will be impacted.
Spectacled Monarch (*Monarcha trivirgatus*)	Understorey of mountain / lowland rainforest, thickly wooded gullies, waterside vegetation, mostly well below canopy. *Summer breeding migrant to south-east Qld and north-east NSW down to Port Stephens from Sept/Oct to May. Uncommon in southern part of range.*	x	-	-
Yellow Wagtail (*Motacilla flava*)	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.	x	-	-
Satin Flycatcher (*Myiagra cyanoleuca*)	Heavily vegetated gullies in forests, taller woodlands, usually above shrub-layer; during migration, coastal forests, woodlands, mangroves, trees in open country, gardens. *Breeds mostly south east Australia and Tasmania over warmer months, winters in north east Qld.*	x	-	-
Rufous Fantail (*Rhipidura rufifrons*)	Undergrowth of rainforests / wetter eucalypt forests / gullies; monsoon forests, paperbarks, sub-inland and coastal scrubs; mangroves, watercourses; parks, gardens. On migration, farms, streets buildings. *Breeding migrant to south east Australia over warmer months. Altitudinal migrant in north east NSW in mountain forests during warmer months.*	✓	x	No likely impact

Common name ***Scientific name***	**Preferred habitat** ***Migratory breeding***	**Suitable habitat present (✓)**	**Recorded present (✓)**	**Comments on potential impacts**
Fork-tailed Swift (*Apus pacificus*)	Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities. *Breeds Siberia, Himalayas, east to Japan south east Asia. Summer migrant to east Australia. Mass movements associated with late summer low pressure systems into east Australia. Otherwise uncommon.*	✓	x	No likely impact

SAII Impact Assessment Species

A2

The additional impact assessment provisions for threatened species to determine a Serious and Irreversible Impact (SAII) are outlined under Section 9.1.2 of the BAM (2020) and have been applied to the recorded Large Bent-winged Bat and Little Bent-winged Bat as follows below. The study area does also contribute to Important Mapped Areas for Swift Parrot and therefore SAII assessment provisions has also been applied to this species below.

Measures taken to avoid the direct and indirect impact on species at risk of SAII are outlined in Section 5.2. We have consulted the Threatened Biodiversity Data Collection (TBDC) and other sources to enable the application of the four principles set out in clause 6.7 of the *BC Reg*. For the species considered this is summarized as follows.

Common Name	Principle				Justification	Reference
	1	2	3	4		
Large Bent-winged Bat				✓	The species is dependent on non-responding attribute (breeding habitat only)	TBDC
Little Bent-winged Bat				✓	The species is dependent on non-responding attribute (breeding habitat only)	TBDC
Swift Parrot	✓				Data from listing determination.	Final Determination

The criteria as specified in Section 9.1.2.4 required to be considered for candidate SAII species nominated is with respect to Principles 1-3 only. As these do not apply to the recorded microbat species a summary is provided below:

Large Bent-winged Bat & **Little Bent-winged Bat** – These species are allocated to species credit class for breeding habitat only. Species sensitivity to loss is indicated by the TBDC as 'moderate'. Species sensitivity to potential gain for breeding is 'very high'. Species sensitivity to potential gain for foraging is 'high'.

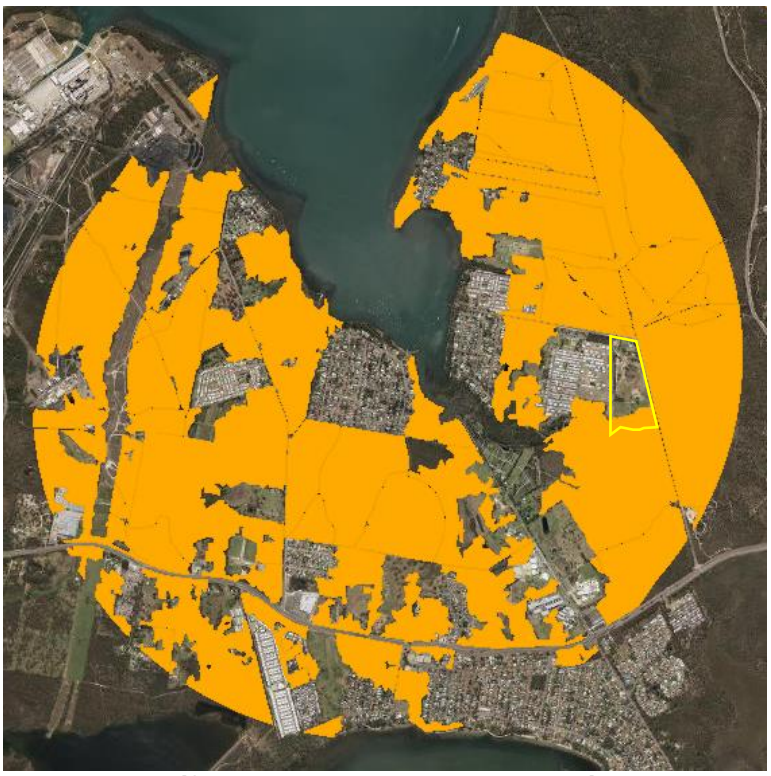
The Large Bent-winged Bat and Little Bent-winged Bat were recorded foraging at both passive ultrasonic recording devices within the study area during 2019 survey. The recorded locations are shown on Figure 2.3.

'Potential breeding habitat' as defined by *The BAM Bat Guide* for these species includes "caves, tunnels, mines or other structures known or suspected to be used". No such habitat exists within the study area or nearby, therefore there will be no likely SAII on Large Bent-winged Bat or Little Bent-winged Bat.

Swift Parrot

Important Area Maps

The study area falls within the DPIE Important Area Map for Swift Parrot as can be seen in the insert below. A closer view of how this important area mapping extends into the site itself can be seen on Figure 4.5.



Swift Parrot – Important Area Mapping

As indicated by DPIE, mapped important areas identify land that is considered important to a few dual credit species that are highly mobile and difficult to reliably detect by survey, and for which DPIE holds extensive, long-term data sets that indicate the importance of areas in the landscape.

No further survey is required if the subject land is in a mapped important area for a species unless the species profile in the TBDC states otherwise. In mapped areas the species is considered present and the part of the subject land that is within the mapped location forms the species polygon used to generate species credits

To establish the localised Important Map Area, a dataset of swift parrot sighting records from 1990-2018 was extracted by DPIE from *BioNet* and *Birdlife Australia*. These are checked, cleaned and then a 2 km radial buffer is applied. This is qualified by sightings of five or more birds recorded over any two or more years, or single sightings of 40 or more birds. The NSW State Vegetation Type Map (including draft East Coast classification) was used to select Plant Community Types associated with the Swift Parrot within the buffers. Any areas less than one hectare were excluded.

Species Background

The Swift Parrot is a migratory species that breeds in Tasmania and its offshore islands in summer, where it feeds mainly on nectar and lerp from eucalypt flowers, particularly

Tasmanian Blue Gum (*Eucalyptus globulus*) (*NSW OEH* 2021) and Swamp Gum (*Eucalyptus ovata*) (*DEWHA* 2010). The proposal will therefore have no impact on breeding habitat for the species.

In late March almost the entire population migrates to mainland Australia spreading from Victoria through to central and coastal NSW and south east Queensland (*Schodde and Tidemann*, 1986). Movements on the mainland are nomadic and eruptive, moving in response to food supply, especially areas of heavily flowering eucalypts (Higgins 1999).

On the mainland, the Swift Parrot congregates where winter flowering species occur such as Red Ironbark (*Eucalyptus sideroxylon*), White Box (*Eucalyptus albens*) and Yellow Gum (*Eucalyptus leucoxylon*) (*Brown*, 1989). This species also occurs within Swamp Mahogany *(Eucalyptus robusta)* or Spotted Gum *(Corymbia maculata)* dominated communities along the coast. The TBDC (*NSW OEH* 2021) also indicates that Red Bloodwood (*C. gummifera*) and Forest Red Gum (*E. tereticornis*) may also be utilised. They also feed on lerps in *Eucalyptus* spp. In NSW, they forage in forests and woodlands throughout the coastal and western slopes region each year. Coastal regions tend to support larger numbers of birds when inland habitats are subjected to drought.

Swift Parrot is allocated to species credit class for breeding habitat which is based on mapped important areas for the species. Ecosystem credit areas are unlikely to have potential serious and irreversible impacts. Much of the locally mapped habitat areas contain the winter flowering Swamp Mahogany (*Eucalyptus robusta*) which has been recorded in use by Swift Parrot within Joshua Porter Reserve on the local nearby Chain Valley Bay foreshores in 2011 and as recent as 2019. These recordings are located just over 1 km to the west and are central to the important mapped habitat area.

The species sensitivity to loss is indicated by the TBDC as 'very high', species sensitivity to potential gain for breeding is 'moderate' and species sensitivity to potential gain for foraging is 'moderate'. The species is recognised as a candidate SAII entity due to Principle 1 in which there is evidence of rapid decline. The species has been subject to annual volunteer-based survey programs both in Tasmania and the mainland since 1995. For the purposes of this assessment and as required by the BAM the species is also considered with respect to Principle 2, based on recent evidence of a potential small population size. *Olah et al.* (2020) report that recent genetic data from DNA sampling indicates that there may be a few as 300 Swift Parrots remaining.

Although the species is not allocated to a suitable survey period within the TBDC (as presence is rather determined by the important mapped areas), 5 hours of survey was undertaken on site in June 2019. Surveys targeted the areas containing the winter flowering resources at these times, primarily Swamp Mahogany associated with the Swamp Sclerophyll Forest. No Swift Parrots were recorded present at this time.

Impact summary - The Important Area Mapping is used for establishing the species polygon and, subsequently, species credits for offsetting. The proposed development will impact 0.028 ha into the Important Area Mapping. This relatively small area of impact is totally within the 1636_grassland PCT which does not contain any trees or usable habitat for Swift Parrot. The extent of the impacted habitat polygon is shown on Figure 5.5.

A recent amendment to the proposed layout has now retained all of PCT 1718. It is now confirmed that no Swamp Mahogany trees will be impacted by the proposal. Red Bloodwood trees will be removed by the proposal, and this impact is discussed further below in a.iii of the assessment. There are no Spotted Gum, Forest Red Gum, Blackbutt or any other tree species identified of importance to Swift Parrot, present within the study area.

Management actions

Relevant management actions outlined by the TBDC include:

- *Reduce collisions in areas where Swift Parrots are foraging by closing window blinds or letting windows get dirty. Alternatively hang wind chimes, mobiles etc in front of windows. Hang strips of fabric across wire mesh fences.*
- *Retain stands of winter-flowering feed-trees, particularly large mature individuals.*
- *Revegetate with winter-flowering tree species where appropriate.*
- *Participate in biannual surveys to locate the winter foraging areas for this species.*

These actions are addressed in the mitigation measures outlined in Section 6.2.

SAII Assessment

As per Section 9.1.2.4 of the BAM 2020 the following information, where available, is provided to determine SAII:

a. the impact on the species' population (Principles 1 and 2) presented by:

i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and

Response: The species was not recorded in the study area during limited single day survey in June 2019. DPIE Important Area Mapping nonetheless assumes presence in mapped areas.

Recorded occurrences of this species between 1995–2014 has been documented by Birds Australia (*Roderick & Igwersen* 2014) within the Lake Macquarie LGA to the immediate north which includes the remaining recordings around the Lake Macquarie foreshores.

This notes that approximately 100 individuals have been recorded together foraging only on 2 occasions within the LGA in this period; in 2007 at Belmont and in 2011 at Dora Creek. All other recordings were between 5 and 25 individual birds recorded within 12 of the 20-year recorded.

The percent of the approximate 2000 (and perhaps as low as 300) total bird population to occupy the locality could vary in any one year but may include a high percentage in any good flowering year. The TBDC, *Roderick & Igwersen* (2014) or the species profile do not specify such varying population estimates to occupy areas of NSW.

We know that Swift Parrots show site fidelity to certain areas or even specific stands of trees on the mainland; however, they do not necessarily return to these every consecutive year (*Pfennigwerth* 2008). Mainland distribution depends largely on food availability. While swift parrots have been shown to return to the same flowering street trees on the central coast of NSW, large numbers of the species would not travel that far if the box-ironbark woodlands of central Victoria had sufficient food (*Pfennigwerth* 2008). Therefore, the number likely to utilise the winter flowering resources for foraging in the immediate locality will vary from year to year and are not likely to visit most years.

We note that there have been very close sightings of the species in recent years and would expect that given there are quite reasonable resources available (nectar) during winter, that it

is possible that in any given year they could occur within the study area. The *eBird Australia* online portal has two nearby identified 'Birding Hotspots' being at Joshua Porter Reserve and Karignan Creek Reserve (see insert below). These reserve locations are within 1.2km and 1km to the west of the study area respectively, as shown on the insert map below (source: *eBird Australia* 11/5/21).

Whilst not marked as red and within the last four weeks, there are records from both birding hotspots from earlier this winter. Records of the species presence goes back to 2011, with other personal recorded locations present nearby also. Hence, the 2 km buffer area has been applied to the species centred on these reserves for the DPIE Important Area Map, which also incorporates the whole of the study area.

Based on these observations and other knowledge of localised habitat use by Swift Parrot, it is possible that anywhere between 1 and over 100 birds may utilise the foraging potential within the study area on any given winter.

Site Proximity to Joshua Porter Reserve and Karignan Creek Reserve

ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or

Response: This would be difficult to estimate for Swift Parrot, however based on the response below for the following question, no individuals are expected to be impacted in any notable extent.

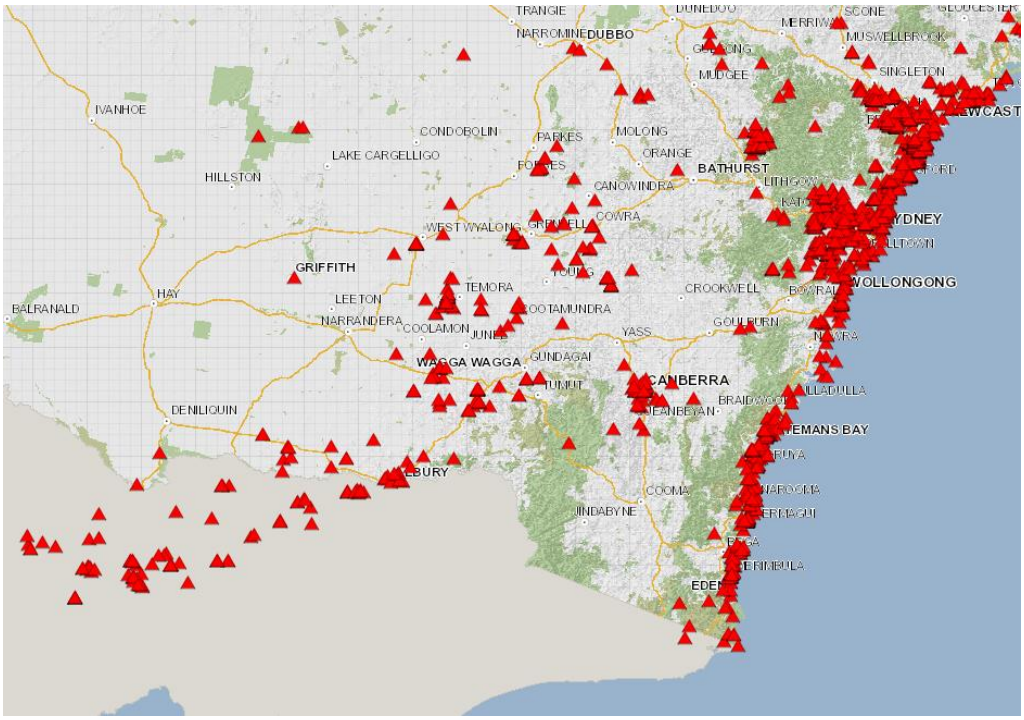
iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal

Response: Following the recent amendments to the masterplan, the proposal will now not impact on any of PCT 1718 or any of the constituent Swamp Mahogany trees present in the study area.

There is some lower potential for removal of roosting or even pre-winter foraging habitat within the development area. Red Bloodwood, whilst not recognised as an important local tree for Swift Parrot foraging has been listed by the as a food tree within the OEH species profile. The exact count of Red Bloodwood trees to be removed has not been calculated to date as part of surveys or a tree report.

The following is an excerpt from a BCAR prepared by *Travers bushfire & ecology* (2021) that considers the local importance of Red Bloodwood as Swift Parrot habitat, for a nearby site also in Chain Valley Bay:

> *Red Bloodwood occurs in coastal areas from eastern Victoria to south-eastern Queensland. The flowering period for Red Bloodwood varies between sources with the peak coinciding with when Swift Parrots first arrive on the mainland in March. Some sources recognise the flowering period to extends between Summer and late Autumn, with a few others recognising that it may also flower into June.*
>
> *Aside from the OEH species profile, a few other sources such as the Tasmanian Swift Parrot Recovery Plan (DPIWE 2001), Australian Threatened Species Network (2007), Birdlife Australia Swift Parrot Search guide (2021), Victorian Beauty of Birds webpage https://www.beautyofbirds.com/swiftparrot.html and Saunders & Heinsohn (2008) also report Red Bloodwood as a recognised feed tree on the mainland. These sources are not however locally specific but rather provide a summary of foraging over the total area of occupation.*
>
> *There are two alternate migration routes undertaken by Swift Parrot on entry into NSW from Victoria, one is west of the ranges and the other is along the south coast, which also aligns with the southern Red Bloodwood distribution. These two routes can be observed in the BioNet insert of southern NSW records below (DPIE 2021)*



Southern NSW records of Swift Parrot (DPIE Bionet 2021)

> *Red Bloodwood is well documented to be of importance to Swift Parrot in the NSW south coast areas. As noted above, these areas are still in the peak of bloodwood flowering when Swift Parrots first enter NSW. The Far South Coast Conservation Management Network newsletter (Cooke 2007) states that the birds rely on winter*

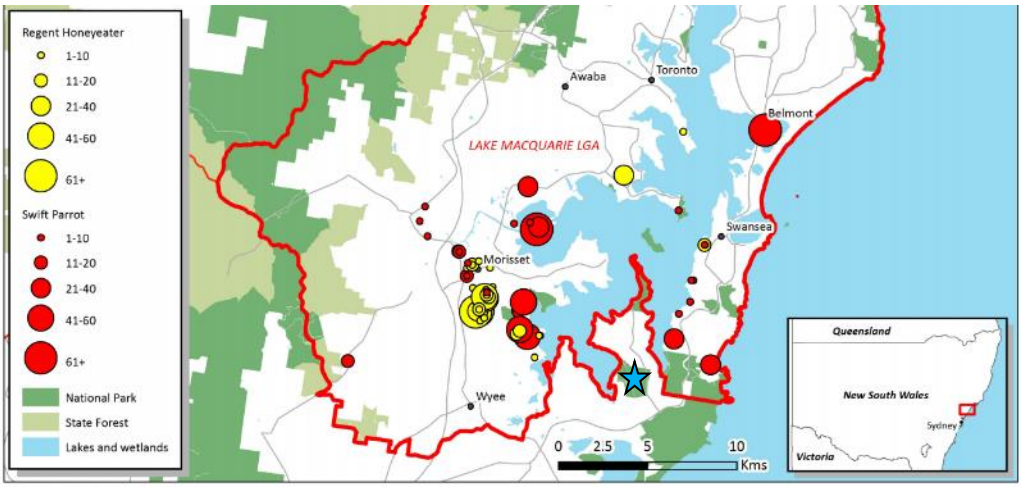
flowering eucalypts (Spotted Gum and Red Bloodwood in the south-east) and also feed on lerp. No other tree species are mentioned. News articles by the Narooma News (Gorton, 2016) and ABC South East NSW (Campbell 2015) also recognise these same two tree species (as well as Swamp Mahogany and Ironbark) of importance for residents to check in the region during the coastal migration.

The National Recovery Plan for the Swift Parrot (Saunders & Tzaros 2011) does however not recognise Red Bloodwood as a key foraging tree species. OEH (2016) in their document Planting to Conserve Threatened Nomadic Pollinators in NSW also does not mention Red Bloodwood as part of the winter flowering diet for the Swift Parrot.

But more specific to the local area, Roderick & Ingwersen (2014, on behalf of Birds Australia) produced a report for Lake Macquarie City Council titled Swift Parrots and Regent Honeyeaters in the Lake Macquarie City Council area of New South Wales: an assessment of status, identification of high priority habitats and recommendations for conservation. The study area, whilst located in the far northern extent of the Central Coast LGA, is located along the southern shores of Lake Macquarie where this document identifies important stands of Swamp Mahogany for both Swift Parrot and Regent Honeyeater (refer to the insert map below).

The document details records of both species in the region from 1995 to 2014. Red Bloodwood is not mentioned from any recordings or significance to Swift Parrot. The report does however mention that whilst Regent Honeyeater is primarily located on sites with Swamp Mahogany there are occasional records in Red Bloodwood generally only of a few days' duration. The report states:

Of interest, an observation from Coal Point in April 2002 (of up to 10 birds) was made of birds feeding on the blossom of Red Bloodwood Corymbia gummifera, a species that is not widely used by Regent Honeyeaters for foraging. However, this record was the very first for 2002, which was the most significant year for Regent Honeyeaters in the Lake Macquarie area in recent years, with birds found feeding in Swamp mahogany blossom only 3 weeks after the Coal Point sighting (where they persisted for at least a month). This was followed by the reports of high numbers around Morisset in June/July (peaking at a count of 100 birds in mid-July). The use of Red Bloodwood is considered likely to have been for birds in transit to the more productive Swamp Mahogany forests.



Proposed Swift Parrot records (red) in the southern Lake Macquarie LGA. *(Roderick & Ingwersen 2014). Study area location shown as a blue star.*

Further to this, Saunders & Heinsohn (2008) in their paper Winter Habitat Use by the Endangered, Migratory Swift Parrot (Lathamus discolor) in New South Wales summarise state-wide tree species and recorded lerp and nectar feeding observations. These are separated into Coastal and Western Slopes regions. Red Bloodwood, whilst not mentioned for the Central Coast region was recorded with one-hundred and thirty

(130) lerp feeding records and no (0) nectar feeding records in the north coast region. Swamp Mahogany by comparison was recorded with one-thousand four-hundred and forty-one (1441) lerp feeding records and seven-hundred and thirty-eight (738) nectar feeding records in the central and north coast regions combined.

A BioNet search of all Swift Parrot records and associated information within 10 km of the study area totalled one-hundred and sixty-five (165) records ranging in observations between one and several hundred birds. Only one record from Wyongah in 2002 mentions use of trees surrounding Swamp Mahogany, including Red Bloodwood, Woollybutt and Forest Red Gum. Swamp Mahogany is mentioned twenty-eight (28) times and Forest Red Gum is mentioned fifty (50) times as observed feed trees in these records. Only about half of the records have foraging notes provided by the observer(s).

It therefore appears from current literature that Red Bloodwood has been of higher potential use for nectar foraging for Swift Parrot in its more southern distribution and lerp feeding in its more northern distribution. This tree species is therefore receiving greater attention for conservation, yet its use is clearly varied across its range. We do not discount that Red Bloodwood within the study area and elsewhere on the Central Coast may provide seasonal foraging potential, perhaps by nectar or lerp. It is however clear from more local analysis of historical foraging evidence that Red Bloodwood is by no means close to the importance of Swamp Mahogany in the Chain Valley Bay locality and the surrounding region.

Therefore the proposal is not expected to amount to any impacts on a single individual or a notable area of habitat.

b. impact on geographic range (Principles 1 and 3) presented by:

i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW

Response: The TBDC does not specify 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

Response: If any individuals are impacted by the loss of potential winter foraging trees then this impact would be minimal given the comparative extent of remaining Swamp Mahogany in the retained portions of the study area and the surrounding locality. Therefore impact MAY affect some habitat, but no individuals of the species will be directly impacted.

iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species

Response: The population will not become fragmented by the proposal. Based on the very small area of mapped habitat to be impacted by comparison to the extent of other locally available winter foraging habitat, it is not likely that this impact extent will cause the population to become less viable.

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.

Response: As the area of impact is minimal and at the outer extent of existing habitat, there will be no notable changes in threats. The current threat of aggressive native species on these fringes of winter flowering habitat will be expected to equally persist. As noted by *Roderick & Igwersen* (2014) direct observations have been made in Lake Macquarie of native species including Rainbow Lorikeets (*Trichoglossus haematodus*), Noisy Friarbirds (*Philemon corniculatus*) and Noisy Miners (*Manorina melanshowing*) showing aggression towards Swift Parrot.

Whilst this type of aggression is normally seen in a “natural” functioning environment, it is believed that the incidence (and hence impact) of such aggression has increased from some species over time, associated with the fragmentation of areas of habitat, making them more suitable to species that would not normally have been so prevalent. This is particularly true for Noisy Miners., and a Final Determination has been made to list them as a Key Threatening Process (KTP) by the NSW Scientific Committee. Noisy Miner and Rainbow Lorikeet were recorded present during survey.

Plot Datasheets

A3

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Plot Identifier	Recorders
18CPCR - Chaw valley	1	GP. BT

Date	Zone	Datum	IBRA region	Photo #	Zone ID
4/2/19	__	__			

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
_ _ _ _ _ _	_ _ _ _ _ _ _	10 x in 100m	Magnetic °

Vegetation Class		Confidence: H M L
Plant Community Type	EEC:	Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	4 3
	Shrubs	6 19
	Grasses etc.	6 9
	Forbs	5 7
	Ferns	1 0
	Other	4 4
Sum of Cover of native vascular plants by growth form group	Trees	32 55
	Shrubs	53.8 22.8
	Grasses etc.	48.1 17.8
	Forbs	0.5 4.8
	Ferns	1 0
	Other	10.6 2.6
High Threat Weed cover		0.2 8.3

BAM Attribute (20 x 50 m plot)	# Tree Stems Count		
dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows†
50 – 79 cm	1		
30 – 49 cm	✓		11 Two in 1 tree
20 – 29 cm	✓		
10 – 19 cm	✓		
5 – 9 cm	✓		n/a
< 5 cm	✓		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	7m	Tally space	total 7m

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	90 80 60 40 20	0 10 20 20 60	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	58			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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

Morphological Type		Landform Element		Landform Pattern		Microrelief	5cm
Lithology		Soil Surface Texture	Sandy	Soil Colour	Light grey	Soil Depth	
Slope	0-2%	Aspect		Site Drainage	Good	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1		
Cultivation (inc. pasture)	0		
Soil erosion	1		
Firewood / CWD removal			
Grazing (identify native/stock)	0		
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/2/19	18CP02 CVB	Q1	GP BT

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 Corymbia gummifera	N	30	20		
T	2 Eucalyptus haemastoma	N	15	10		
T	3 Allocasuarina littoralis	N	10	6		
S	4 Lambertia formosa	N	5	10		
S	5 Banksia oblongifolia	N	3	15		
F	6 Dianella caerulea	N	1	20		
O	7 Xanthorhoea media	N	2	10		
S	8 Platysace linearifolia	N	1	10		
F	9 Actinotus minor	N	3	20		
S	10 Leptospermum trinervium	N	2	5		
G	11 Eragrostis brownii	N	0.1	10		
G	12 Dichelachne micrantha	N	0.2	10		
S	13 Acacia suaveolens	N	2	10		
G	14 Lomandra glauca	N	0.2	10		
S	15 Bossiaea heterophylla	N	0.1	5		
S	16 Petrophile pulchella	N	1	10		
G	17 Entolasia stricta	N	3	200		
G	18 Anisopogon avenaceus	N	8	100		
G	19 Panicum simile	N	2	50		
S	20 Epacris pulchella	N	1	20		
G	21 Themeda triandra	N	4	100		
S	22 Pimelia linifolia	N	1	20		
F	23 ~~Lambertia formosa~~ yellow flowers	N	0.4	20		
F	24 Trachymene incisa	N	0.1	5		
S	25 Mirbelia speciosa	N	0.1	5		
S	26 Hakea dactyloides	N	0.1	3		
—	27 Richardia	E	0.1	3		
—	28 Hypochaeris radicata	E	0.1	3		
S	29 Acacia longifolia	N	0.2	5		
S	30 Banksia marginata	N	2	3		
F	31 Stylidium lineare	N	0.1	3		
S	32 Gompholobium glaberratum	N	0.1	3		
S	33 Acacia myrtifolia	N	0.1	3		
S	34 Baeckea diosmifolia	N	0.1	3		
S	35 Persoonia levis	N	3	10		
—	36 carpet grass = Axonopus fissifolius	HTE	0.1	3		
F	37 Cryptostylis subulata	N	0.1	5		
O	38 Glycine clandestina	N	0.1	3		
—	39 Paspalum urvelii	HTE	4	10		
O	40 Cassytha glabella	N	0.1	3		

Stackhousia nuda

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/2/19	18CP02 CUB	C1	GP BT

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
F	1 Centella asiatica	N	0.1	3		
S	2 Pittosporum undulatum	N	0.3	3		
—	3 Plantago lanceolata	E	0.1	5		
—	4 Buffalo grass	HTE	4	100		
—	5 Conyza sumatrensis	E	0.1	3		
O	6 Hardenbergia violacea	N	0.4	3		
—	7 Hydrocotyle bonariensis	E	0.1	3		
—	8 Solanum nigrum	E	0.1	3		
G	9 Echinopogon caespitosus	N	0.2	5		
—	10 Bidens pilosa	HTE	0.1	5		
—	11 Sida rhomb.	E	0.2	10		
—	12 Cyperus eragrostis	HTE	0.1	5		
—	13 Rubus fruticosus sp. agg.	HTE	2	5		
S	14 Dillwynia retorta	N	0.5	3		
—	15 pampas gras	HTE	0.1	1		
G	16 Lepyrodia scariosa	N	0.1	3		
	17					
	18					
	19					
	20					
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	22					
	23					
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	25					
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	34					
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Survey Name	Plot Identifier	Recorders
18CP02- Chain-Valley	2	GP, BT

Date	Zone	Datum	IBRA region	Photo #	Zone ID
14/2/19	__				

Easting	Northing	Dimensions	Orientation of midline from the 0 m point.
_ _ _ _ _ _	_ _ _ _ _ _	20 x 50	Magnetic °

Vegetation Class	Confidence: H M L

Plant Community Type	EEC:	Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	5
	Shrubs	8
	Grasses etc.	12
	Forbs	9
	Ferns	0
	Other	4
Sum of Cover of native vascular plants by growth form group	Trees	38.2
	Shrubs	2.7
	Grasses etc.	69.8
	Forbs	1.1
	Ferns	0
	Other	1.7
High Threat Weed cover		25.1

BAM Attribute (20 x 50 m plot)	# Tree Stems Count		
dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows†
50 – 79 cm	IIII		1
30 – 49 cm	✓		
20 – 29 cm			
10 – 19 cm	✓		
5 – 9 cm			n/a
< 5 cm	✓		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	10m Tally space		total 10 m

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	40 30 50 10 20	0 10 0 0 30	0 0 0 0 0	0 10 0 0 40
Average of the 5 subplots	30			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology	Sandstone	Soil Surface Texture	sandy	Soil Colour	Pale grey / yellow	Soil Depth	
Slope		Aspect		Site Drainage	good	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3		
Cultivation (inc. pasture)	0		
Soil erosion	2-3		
Firewood / CWD removal			
Grazing (identify native/stock)	0		
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/2/19	18EP02 CVD	GV	CM HT

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1 Corymbia gummifera	N	15	4		
T	2 Eucalyptus haemastoma	N	15	4		
T	3 Allocasuarina ~~torulosa~~ littoralis	N	8	5		
G	4 Themeda triandra	N	50	4000		
T	5 Glochidion Ferdinandi	N	0.1	3		
S	6 Acacia longifolia	N	1	4		
G	7 Eragrostis brownii	N	3	100		
F	8 Trachymene incisa	N	0.1	5		
G	9 Lomandra cylindrica	N	1	30		
O	10 Cassytha glabella	N	0.1	3		
S	11 Epacris pulchella	N	0.2	10		
O	12 Xanthorrhoea media	N	1	10		
G	13 * twisted monocot = Cyathochaeta diandra	N	0.2	5		
S	14 Leptospermum trinervium	N	0.1	3		
S	15 Pultenaea daphnoides	N	0.1	3		
F	16 Thysanotus tuberosus	N	0.3	20		
—	17 Hydrocotyle bonariensis	E	0.1	3		
G	18 Lepyrodia scariosa	N	2	100		
S	19 Pimelea linearifolia	N	0.1	3		
—	20 Paspalum urvelii	HTE	4	100		
—	21 Kikuyu	HTE	5	200		
S	22 Banksia oblongifolia	N	1	5		
—	23 Hypochaeris radicata	E	0.1	10		
F	24 > Pratia purpurascens	N	0.1	10		
—	25 Rubus fruticosus	HTE	0.1	3		
F	26 Dianella caerulea	N	0.1	3		
F	27 Patersonia sericea	N	0.1	5		
G	28 Anisopogon avenaceus	N	4	100		
F	29 Haemodorum planifolium	N	0.1	3		
G	30 Echinopogon caespitosus	N	2	50		
G	31 Entolasia stricta	N	0.3	20		
T	32 * pinnate shrub - ph Melia azedarach	N	0.1	1		
F	33 Hydrocotyle peduncularis	N	0.1	3		
S	34 Lambertia formosa	N	0.1	3		
G	35 Cynodon dactylon	N	3	100		
—	36 buffalo grass	HTE	8	2000		
—	37 Gamochaeta	E	0.1	~~100~~ 5		
O	38 Glycine clandestina	N	0.1	5		
O	39 ~~Hardenbergia violacea~~ Parsonsia straminea	N	0.5	3		
—	40 Richardia	E	0.2	10		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14 / 2 / 19	18CPOR CWB	Q2	GW BT

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
—	1 Hypochaeris ~~radicata~~? hirta	HTE	5	200		
—	2 Plantago lanceolata	E	0.1	3		
G	3 Imperata cylindrica	N	4	2000		
—	4 bittou bush	HTE	3	10		
G	5 Lomandra glauca	N	0.2	10		
—	6 Setaria parviflora	E	0.1	5		
S	7 Platysace linearifolia	N	0.1	1		
F	8 * Cassia parviflora Montrat - see photo 18	N	0.1	1		
G	9 Lepidosperma laterale	N	0.1	3		
—	10 Goreogosis lanceolata	E	0.2	10		
F	11 Stylidium lineare	N	0.1	5		
	12					
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					
	21					
	22					
	23					
	24					
	25					
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	27					
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	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36					
	37					
	38					
	39					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

	Survey Name	Plot Identifier	Recorders
Date: 14/2/19	18CP02. Chain Valley	3	GP, BT

Zone	Datum	IBRA region		Photo #		Zone ID	
Easting	Northing	Dimensions	20 x 50	Orientation of midline from the 0 m point.		Magnetic °	

Vegetation Class			Confidence: H M L
Plant Community Type		EEC:	Confidence: H M L

Record easting and northing from the plot marker. If applicable, orient picket so that perforated rib points along direction of midline.
Dimensions (Shape) of 0.04 ha base plot inside 0.1 ha FA plot should be identified, magnetic bearing taken along midline.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	4
	Shrubs	6
	Grasses etc.	6
	Forbs	5
	Ferns	1
	Other	4
Sum of Cover of native vascular plants by growth form group	Trees	32
	Shrubs	53.8
	Grasses etc.	48.1
	Forbs	0.5
	Ferns	1
	Other	10.4
High Threat Weed cover		0.2

BAM Attribute (20 x 50 m plot)	# Tree Stems Count		
dbh	Euc*	Non Euc	Hollows†
large trees for Euc* & Non Euc 80 + cm	Euc*	Non Euc	Hollows†
50 – 79 cm			
30 – 49 cm			
20 – 29 cm	✓		
10 – 19 cm	✓		
5 – 9 cm	✓		n/a
< 5 cm	✓		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1m Tally space		total 2m

Record number of **living** eucalypt* (Euc*) and **living native** non-eucalypt (Non Euc) stems separately

* includes all species of *Eucalyptus*, *Corymbia*, *Angophora*, *Lophostemon* and *Syncarpia*

† Record total number of stems by size class with hollows (including dead stems/trees)

Counts must apply to each size class when the **number of living tree stems** within the size class is ≤ 10. Estimates can be used when the number of living tree stems within a class is > 10. Estimates should draw from the number series: 10, 20, 30..., 100, 200, 300

For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. For **hollows** count only the presence of a stem containing hollows, not the count of hollows in that stem. Only count as 1 stem per tree where tree is multi-stemmed. The hollow-bearing stem may be a dead stem.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	80	75	40	60	80	0	0	0	0	0	0	0	0	0	0	10	0	0	10	0
Average of the 5 subplots	67																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots located on alternate sides and 5 m from the plot midline at the locations 5, 15, 25, 35, and 45 m along the midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Within these 1 m x 1 m plots assessors may also record the cover of rock, bare ground and cryptogam soil crusts. Collection of these data is optional - the data do not currently contribute to assessment scores, they hold potential value for future vegetation integrity assessment attributes and benchmarks, and for enhancing PCT description

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

Morphological Type		Landform Element		Landform Pattern		Microrelief	30cm
Lithology		Soil Surface Texture	Sand/Clay	Soil Colour	Dark Brown/Black	Soil Depth	
Slope		Aspect		Site Drainage	poor	Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	
Cultivation (inc. pasture)	0		
Soil erosion	2		
Firewood / CWD removal			
Grazing (identify native/stock)	0		
Fire damage	1-2		
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 14/3/19	18CP02 CVD	623	GC BT

GF Code		Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
T	1	Angophora costata	N	15	10		
T	2	Corymbia gummifera	N	10	5		
S	3	Acacia longifolia	N	40	20		
S	4	Putteneaea villosa? (5) ✓	N	1	5		✓
G	5	Gahnia clarkei	N	20	15		
F	6	Pteridium esculentum	N	10	200		
G	7	Imperata cylindrica	N	15	2000		
F	8	Dianella caerulea	N	0.1	10		
O	9	Hardenbergia violacea	N	0.2	5		
O	10	Cassytha glabeola	N	0.1	5		
S	11	Putteneaea linophylla	N	0.3	10		
T	12	Allocasuarina littoralis	N	2	5		
G	13	Entolasia stricta	N	2	100		
F	14	Gonocarpus teucrioides	N	0.1	10		
O	15	Hibbertia dentata	N	0.1	5		
S	16	Melaleuca sieberi? ✓s	N	10	20		✓
T	17	Eucalyptus robusta	N	5	4		
S	18	Acacia ulicifolia	N	2	15		
E	19	* Fern ~~Microsorum~~ Adiantum aethiopicum - ph	N	1	50		ph
G	20	Paspalidium distans grass s	N	0.1	10		s
—	21	Rubus fruticosus	HTE	0.2	5		
~~—~~	~~22~~	~~Acacia ulicifolia~~	~~N~~	~~2~~	~~10~~		
F	23	Villarsia exalata	N	0.1	10		
G	24	Lomandra longifolia	N	1	5		
G	25	Empodisma minus	N	10	200		
F	26	Gonocarpus micranthus	N	0.1	5		
F	27 *	Hydrocotyle/Rammeatus? ph laxiflora	N	0.1	3		
S	28	Putteneaea diapensioides	N	0.5	3		
	29						
	30						
	31						
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no: 1 of 2

		Survey Name	Zone ID	Recorders			
Date	10/12/20	18CP02		GP			
Zone	Datum	Plot ID	Q4	Plot dimensions	20 x 50	Photo #	✓
Easting	Northing	IBRA region	In m	Midline bearing from 0 m	Magnetic °		
Vegetation Class						Confidence: H M L	
Plant Community Type				EEC: tick		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	0
	Grasses etc.	4
	Forbs	3
	Ferns	1
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0
	Grasses etc.	6.2
	Forbs	2.3
	Ferns	0.1
	Other	0
High Threat Weed cover		67.5

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm	✓	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	5 80 60 8 75	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	45.6															

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400m² plot: Sheet of	Survey Name	Plot Identifier	Recorders
Date 10/12/2020	18CM02	124	CM

GF	Top 3 natives in each GF: Full species name mandatory. All others where practicable	N	E	HTE	Cover %	Abund	voucher
	1 Hyparrhenia hirta	✓		✓	50	2000	
	2 Hyparrhenia rufa		✓		1	50	
	3 Bothriochloa insculpta		✓		20	2000	
	4 Stenotaphrum secundatum			✓	5	100	
	5 Briza minor		✓		2	20	
	6 Cynodon dactylon		✓		0.1	20	
	7 Eragrostis brownii	✓			1	20	
	8 small sedge - Fimbristylis dichotoma	✓			3	100	✓
	9 unidentified origin? - 3 mericarps dehiscent fruit		✓		1	20	
	10 Richardia stellaris		✓		2	20	
	11 Schenkia australis	✓			0.1	50	
	12 Vulpia ~~myuros~~ bromoides		✓		2	30	
	13 Cynodon dactylon	✓			2	50	
	14 Plantago lanceolata		✓		1	30	
	15 Senecio madagascariensis			✓	0.5	20	
	16 Anagallis arvensis (pink)		✓		0.1	10	
	17 Rubus fruticosus sp. agg.			✓	5	3	
	18 Lotus		✓		0.1	3	
	19 Verbena bonariensis		✓		0.1	3	
	20 Setaria parvifolia		✓		2	20	
	21 Paspalum dilatatum			✓	3	10	
	22 Centella asiatica	✓			2	20	
	23 Veronica persica		✓		0.1	3	
	24 Paspalum urvillei		✓		1	10	
	25 Briza ~~subaristata~~ subaristata			✓	3	50	
	26 Eriachiton sphaericus	✓			0.2	50	
	27 ~~Liliaceae~~ Watsonia meriana			✓	1	10	ph
	28 Sida rhombifolia		✓		0.1	3	
	29 Daucus carrota		✓		0.1	5	
	30 Sporobolus africanus		✓	✓	0.1	5	
	31 Themeda triandra	✓			0.2	1	
	32 Cheilanthes sieberi	✓			0.1	5	
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						
	41						
	42						
	43						
	44						
	45						
	46						
	47						

GF Code: see growth form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF – circle code of 'top 3'
Cover: 0.1, 0.2, 0.3..... 1, 2, 3 ..... 10, 15, 20, 25 .....100% (foliage cover): ***Note:*** *0.1% cover = 63 x 63 cm or a circle 71 cm across, 0.5% cover = 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10m.* **Abundance:** 1, 2, 3...10, 20, 30....100, 200...1000...

BAM Site – Field Survey Form

Site Sheet no: 1 of ____

Date	10/12/20	Survey Name	18CP02	Zone ID		Recorders	CP		
Zone	Datum	Plot ID	Q5			Plot dimensions	20x50	Photo #	✓
Easting	Northing	IBRA region		In m		Midline bearing from 0 m		Magnetic °	
Vegetation Class								Confidence: H M L	
Plant Community Type						EEC: tick		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	0
	Grasses etc.	2
	Forbs	3
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0
	Grasses etc.	3.5
	Forbs	1.6
	Ferns	0
	Other	0
High Threat Weed cover		96.2

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)						Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	60	85	70	95	05		a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
Average of the 5 subplots	67																				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400m² plot: Sheet 2 of		Survey Name	Plot Identifier	Recorders
Date	10/12/2020	18CP82	Q5	GP

GF	Top 3 natives in each GF: Full species name mandatory. All others where practicable	N	E	HTE	Cover %	Abund	voucher
	1 Hypochaeris hirta			✓	20	1000	
	2 Stellotaphrum secundatum			✓	70	3000	
	3 Setaria parvifolia		✓		2	20	
	4 Briza maxima		✓		10	800	
	5 Lotus		✓		10	100	
	6 Plantago lanceolata		✓		2	50	
	7 Juncus usitatus	✓			0.5	20	
	8 Paspalum dilatatum ~~wrightii~~		✓	✓	3	20	
	9 Hypochaeris radicata		✓		1	20	
	10 Schenkia australis	✓			0.1	20	
	11 Centella asiatica	✓			1	20	
	12 Hydrocotyle bonariensis		✓		5	30	
	13 Cyperus eragrostis			✓	0.1	5	
	14 Phalaris aquatica		✓		1	20	
	15 Briza ~~minor~~ ✓		✓		0.1	10	
	16 Trifolium repens		✓		0.1	5	
	17 Verbena bonariensis		✓		0.1	3	
	18 Vulpia ~~myuros~~ bromoides		✓		0.1	3	
	19 carpet grass			✓	5	80	
	20 Cynodon dactylon	✓			3	50	
	21 Briza subaristata			✓	1	10	
	22 Senecio madagascariensis			✓	0.1	3	
	23 Anagalis arvensis (pink)		✓		0.1	3	
	24 Hard onion weed - purple flowers		✓		0.1	3	
	25 Euchiton sphaericus	✓			0.5	50	
	26						
	27						
	28						
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GF Code: see growth form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF – circle code of 'top 3'
Cover: 0.1, 0.2, 0.3..... 1, 2, 3 ..... 10, 15, 20, 25 .....100% (foliage cover): ***Note:*** *0.1% cover = 63 x 63 cm or a circle 71 cm across, 0.5% cover = 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10m.* **Abundance:** 1, 2, 3...10, 20, 30....100, 200...1000...

BAM Site – Field Survey Form

Site Sheet no: 1 of _____

		Survey Name	Zone ID	Recorders			
Date	10/12/20	18CP02		GP			
Zone	Datum	Plot ID	Q6	Plot dimensions	20x50	Photo #	✓
Easting	Northing	IBRA region	In m	Midline bearing from 0 m		Magnetic °	
Vegetation Class						Confidence: H M L	
Plant Community Type				EEC: tick		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	0
	Grasses etc.	0
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	0
	Grasses etc.	0
	Forbs	1.1
	Ferns	0
	Other	0
High Threat Weed cover		65.2

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm		
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0	Tally space

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e	a	b	c	d	e
	5	5	2	3	4															
Average of the 5 subplots	3.8																			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

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

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			Horse paddock
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400m² plot: Sheet 2 of	Survey Name	Plot Identifier	Recorders
Date 10/12/2020	18CP07	Q6	GP

GF	Top 3 natives in each GF: Full species name mandatory. All others where practicable	N	E	HTE	Cover %	Abund	voucher
	1 Cenchrus clandestinus			✓	25	800	
	2 Sida rhombifolia		✓		6	100	
	3 Lotus		✓		4	100	
	4 Hypochaeris radicata		✓		5	400	
	5 Trifolium repens		✓		1	10	
	6 Plantago lanceolata		✓		6	150	
	7 Conyza sumatrensis		✓		0.1	20	
	8 Briza maxima		✓		1	10	
	9 Euchiton sphaericus	✓			1	100	
	10 carpet grass - Axonopus affinis			✓	40	2000	
	11 weed - small leaves		✓		0.1	10	✓
	12 Centella asiatica	✓			0.1	10	
	13 Vulpia ~~myuros~~ bromoides		✓		2	50	
	14 Lolium perene		✓		2	40	
	15 ~~Bromus-like~~		✓		~~1~~	~~20~~	
	16 Senecio madagascariensis			✓	0.1	10	
	17 Rubus fruticosus sp. agg.			✓	0.1	5	
	18						
	19						
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	25						
	26						
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	46						
	47						

GF Code: see growth form definitions in Appendix 1 N: native, E: exotic, HTE: high threat exotic GF – circle code of 'top 3'
Cover: 0.1, 0.2, 0.3..... 1, 2, 3 ..... 10, 15, 20, 25 .....100% (foliage cover): ***Note:*** *0.1% cover = 63 x 63 cm or a circle 71 cm across, 0.5% cover = 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10m.* **Abundance:** 1, 2, 3...10, 20, 30....100, 200...1000...

National - Significant Impact Criteria

A4

Under the *EPBC Act* an action will require approval from the Australian Government Environment Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance. The following significant impact criteria were sourced from the *EPBC Act* Policy Statement 1.1 (May 2006):

CRITICALLY ENDANGERED AND ENDANGERED SPECIES

Significant impact criteria

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.

>> What is a population of a 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.

>> What is habitat critical to the survival of a species or ecological community?

'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.*

VULNERABLE SPECIES

Significant impact criteria

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.

>> What is an important population of a 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.

CRITICALLY ENDANGERED AND ENDANGERED ECOLOGICAL COMMUNITIES

Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered ecological community if there is a real chance or possibility that it will:

- Reduce the extent of an ecological community;
- Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;
- Adversely affect habitat critical to the survival of an ecological community;
- Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;
- Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;
- Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:
  - assisting invasive species, that are harmful to the listed ecological community, to become established; or
  - causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community; or
- Interfere with the recovery of an ecological community.

MIGRATORY SPECIES

Significant impact criteria

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

- Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

>> What is important habitat for a migratory species?

An area of 'important habitat' for a migratory species is:

a) Habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species; and/or
b) Habitat that is of critical importance to the species at particular life-cycle stages; and/or
c) Habitat utilised by a migratory species which is at the limit of the species range; and/or
d) Habitat within an area where the species is declining.

>> What is an ecologically significant proportion?

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an 'ecologically significant proportion' of the population varies with the species (each circumstance will need to be evaluated). Some factors that should be considered include the species' population status, genetic distinctiveness and species specific behavioural patterns (for example, site fidelity and dispersal rates).

>> What is the population of a migratory species?

'Population', in relation to migratory species, means the entire population or any geographically separate part of the population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries including Australia.

BAM-C outputs

A5

BAM Credit Summary Report

Proposal Details

Assessment Id
00014301/BAAS19010/19/00014302

Proposal Name
45 Mulloway

BAM data last updated *
10/06/2021

Assessor Name
Corey Mead

Report Created
04/08/2021

BAM Data version *
45

Assessor Number
BAAS19050

BAM Case Status
Finalised

Date Finalised
04/08/2021

Assessment Revision
3

Assessment Type
Part 4 Developments (General)

BOS entry trigger
BOS Threshold: Biodiversity Values Map and area clearing threshold

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast											
1	1636_good	Not a TEC	64.4	64.4	0.45			High Sensitivity to Potential Gain	1.75		13
2	1636_poor	Not a TEC	58.8	58.8	0.72			High Sensitivity to Potential Gain	1.75		19

3	1636_grassland	Not a TEC	4.7	4.7	6			High Sensitivity to Potential Gain	1.75		0
										Subtotal	**32**
										Total	**32**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Diuris praecox / Rough Doubletail (Flora)								
1636_good	64.4	64.4	0.45	Vulnerable	Vulnerable	1.5	False	11
1636_poor	58.8	58.8	0.72	Vulnerable	Vulnerable	1.5	False	16
							Subtotal	**27**
Lathamus discolor / Swift Parrot (Fauna)								
1636_grassland	4.7	4.7	0.03	Endangered	Critically Endangered	3	True	1
							Subtotal	**1**
Myotis macropus / Southern Myotis (Fauna)								
1636_good	64.4	64.4	0.45	Vulnerable	Not Listed	2	False	14
1636_poor	58.8	58.8	0.72	Vulnerable	Not Listed	2	False	21
1636_grassland	4.7	4.7	6	Vulnerable	Not Listed	2	False	14
							Subtotal	**49**
Petaurus norfolcensis / Squirrel Glider (Fauna)								
1636_good	64.4	64.4	0.45	Vulnerable	Not Listed	2	False	14
1636_poor	58.8	58.8	0.72	Vulnerable	Not Listed	2	False	21
							Subtotal	**35**

Tyto novaehollandiae / Masked Owl (Fauna)								
1636_poor	58.8	58.8	0.04	Vulnerable	Not Listed	2	False	1
							Subtotal	**1**

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00014301/BAAS19010/19/00014302	45 Mulloway	10/06/2021
Assessor Name	**Report Created**	**BAM Data version ***
Corey Mead	04/08/2021	45
Assessor Number	**Assessment Type**	**BAM Case Status**
BAAS19050	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
3	04/08/2021	BOS Threshold: Biodiversity Values Map and area clearing threshold

* 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.

Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones

1	1636_good	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	good	0.45	1	
2	1636_poor	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	poor	0.72	1	
3	1636_grassland	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	grassland	5.95	3	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00014301/BAAS19010/19/00014302	45 Mulloway	10/06/2021
Assessor Name	Report Created	BAM Data version *
Corey Mead	04/08/2021	45
Assessor Number	Assessment Type	BAM Case Status
BAAS19050	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
3	BOS Threshold: Biodiversity Values Map and area clearing threshold	04/08/2021

* 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)
Barking Owl	Ninox connivens	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Black-chinned Honeyeater (eastern subspecies)	Melithreptus gularis gularis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Eastern Chestnut Mouse	Pseudomys gracilicaudatus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Eastern Coastal Free-tailed Bat	Micronomus norfolkensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Eastern Osprey	Pandion cristatus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Gang-gang Cockatoo	Callocephalon fimbriatum	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Glossy Black-Cockatoo	Calyptorhynchus lathami	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

Golden-tipped Bat	Phoniscus papuensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Greater Broad-nosed Bat	Scoteanax rueppellii	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Grey-crowned Babbler (eastern subspecies)	Pomatostomus temporalis temporalis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Grey-headed Flying-fox	Pteropus poliocephalus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Koala	Phascolarctos cinereus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Large Bent-winged Bat	Miniopterus orianae oceanensis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Little Bent-winged Bat	Miniopterus australis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Little Eagle	Hieraaetus morphnoides	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Little Lorikeet	Glossopsitta pusilla	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Masked Owl	Tyto novaehollandiae	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Powerful Owl	Ninox strenua	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Scarlet Robin	Petroica boodang	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Speckled Warbler	Chthonicola sagittata	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Spotted-tailed Quoll	Dasyurus maculatus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Square-tailed Kite	Lophoictinia isura	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Swift Parrot	Lathamus discolor	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Turquoise Parrot	Neophema pulchella	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Varied Sittella	Daphoenositta chrysoptera	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
White-bellied Sea-Eagle	Haliaeetus leucogaster	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

White-throated Needletail	Hirundapus caudacutus	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Yellow-bellied Glider	Petaurus australis	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast
Yellow-bellied Sheathtail-bat	Saccolaimus flaviventris	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

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

Common Name	Scientific Name	Plant Community Type(s)
Painted Honeyeater	Grantiella picta	1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

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
Painted Honeyeater	Grantiella picta	Species is vagrant

BAM Candidate Species Report

Proposal Details

Assessment Id 00014301/BAAS19010/19/00014302	Proposal Name 45 Mulloway	BAM data last updated * 10/06/2021
Assessor Name Corey Mead	Report Created 04/08/2021	BAM Data version * 45
Assessor Number BAAS19050	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 3	Date Finalised 04/08/2021	BOS entry trigger BOS Threshold: Biodiversity Values Map and area clearing threshold

* 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
Acacia bynoeana Bynoe's Wattle	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Angophora inopina Charmhaven Apple	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Astrotricha crassifolia Thick-leaf Star-hair	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Callistemon linearifolius Netted Bottle Brush	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Corunastylis sp. Charmhaven (NSW896673) Corunastylis sp. Charmhaven (NSW896673)	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Crinia tinnula Wallum Froglet	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Cryptostylis hunteriana Leafless Tongue Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Diuris praecox Rough Doubletail	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Eucalyptus camfieldii Camfield's Stringybark	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Genoplesium insigne Variable Midge Orchid	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Grevillea parviflora subsp. parviflora Small-flower Grevillea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Lathamus discolor Swift Parrot	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Melaleuca groveana Grove's Paperbark	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	Yes (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☑ Survey month outside the specified months?
Petauroides volans Greater Glider	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Petaurus norfolcensis Squirrel Glider	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Rutidosis heterogama Heath Wrinklewort	No (surveyed)	☐ Jan ☐ Feb ☑ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Tetratheca glandulosa Tetratheca glandulosa	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Tetratheca juncea Black-eyed Susan	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	Yes (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☑ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

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	Refer to BAR
Brush-tailed Phascogale	Phascogale tapoatafa	Species is vagrant
Brush-tailed Rock-wallaby	Petrogale penicillata	Refer to BAR
Common Planigale	Planigale maculata	Species is vagrant
Eastern Osprey	Pandion cristatus	Refer to BAR
Eastern Pygmy-possum	Cercartetus nanus	Habitat degraded
Gang-gang Cockatoo	Callocephalon fimbriatum	Refer to BAR
Giant Burrowing Frog	Heleioporus australiacus	Species is vagrant
Glossy Black-Cockatoo	Calyptorhynchus lathami	Refer to BAR
Green and Golden Bell Frog	Litoria aurea	Refer to BAR
Green-thighed Frog	Litoria brevipalmata	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Refer to BAR

Large Bent-winged Bat	Miniopterus orianae oceanensis	Refer to BAR
Large-eared Pied Bat	Chalinolobus dwyeri	Refer to BAR
Little Bent-winged Bat	Miniopterus australis	Refer to BAR
Little Eagle	Hieraaetus morphnoides	Refer to BAR
Long-nosed Potoroo	Potorous tridactylus	Species is vagrant
Mahony's Toadlet	Uperoleia mahonyi	Refer to BAR
Powerful Owl	Ninox strenua	Refer to BAR
Square-tailed Kite	Lophoictinia isura	Refer to BAR
Tranquility Mintbush	Prostanthera askania	Refer to BAR
White-bellied Sea-Eagle	Haliaeetus leucogaster	Refer to BAR

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00014301/BAAS19010/19/00014302

Proposal Name
45 Mulloway

BAM data last updated *
10/06/2021

Assessor Name
Corey Mead

Assessor Number
BAAS19050

BAM Data version *
45

Proponent Names
Carol Richardson, MHE Property Co Pty Ltd ATF MHE Land Trust 3

Report Created
04/08/2021

BAM Case Status
Finalised

Assessment Revision
3

Assessment Type
Part 4 Developments (General)

Date Finalised
04/08/2021

BOS entry trigger
BOS Threshold: Biodiversity Values Map and area clearing threshold

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

Potential Serious and Irreversible Impacts

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

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Grantiella picta / Painted Honeyeater

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
1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	Not a TEC	7.1	13	19	32

BAM Biodiversity Credit Report (Like for like)

1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_good	Yes	13	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_poor	No	19	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_grassland	No	0	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

BAM Biodiversity Credit Report (Like for like)

Species	Vegetation Zone/s	Area / Count	Credits
Diuris praecox / Rough Doubletail	**1636_good, 1636_poor**	1.2	27.00
Lathamus discolor / Swift Parrot	**1636_grassland**	0.0	1.00
Myotis macropus / Southern Myotis	**1636_good, 1636_poor, 1636_grassland**	7.1	49.00
Petaurus norfolcensis / Squirrel Glider	**1636_good, 1636_poor**	1.2	35.00
Tyto novaehollandiae / Masked Owl	**1636_poor**	0.0	1.00

Credit Retirement Options

Like-for-like credit retirement options

Diuris praecox / Rough Doubletail	Spp	IBRA subregion
	Diuris praecox / Rough Doubletail	Any in NSW
Lathamus discolor / Swift Parrot	Spp	IBRA subregion
	Lathamus discolor / Swift Parrot	Any in NSW
Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Petaurus norfolcensis / Squirrel Glider	Spp	IBRA subregion
	Petaurus norfolcensis / Squirrel Glider	Any in NSW

Tyto novaehollandiae / Masked Owl	Spp	IBRA subregion
	Tyto novaehollandiae / Masked Owl	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00014301/BAAS19010/19/00014302

Proposal Name

45 Mulloway

BAM data last updated *

10/06/2021

Assessor Name

Corey Mead

Assessor Number

BAAS19050

BAM Data version *

45

Proponent Name(s)

Carol Richardson, MHE Property Co Pty Ltd ATF MHE Land Trust 3

Report Created

04/08/2021

BAM Case Status

Finalised

Assessment Revision

3

Assessment Type

Part 4 Developments (General)

Date Finalised

04/08/2021

BOS entry trigger

BOS Threshold: Biodiversity Values Map and area clearing threshold

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

Potential Serious and Irreversible Impacts

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

Species
Lathamus discolor / Swift Parrot

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Grantiella picta / Painted Honeyeater

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
1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast	Not a TEC	7.1	13	19	32.00

1636-Scribbly Gum - Red Bloodwood - Angophora inopina heathy woodland on lowlands of the Central Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_good	Yes	13	Wyong,Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_poor	No	19	Wyong,Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Sydney Coastal Dry Sclerophyll Forests This includes PCT's: 1138, 1253, 1625, 1636, 1638, 1776, 1778, 1782, 1786	Sydney Coastal Dry Sclerophyll Forests >=50% and <70%	1636_grassland	No	0	Wyong,Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1636_good	Yes (including artificial)	13	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1636_poor	No	19	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1636_grassland	No	0	IBRA Region: Sydney Basin, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Diuris praecox / Rough Doubletail	**1636_good, 1636_poor**	1.2	27.00
Lathamus discolor / Swift Parrot	**1636_grassland**	0.0	1.00

Myotis macropus / Southern Myotis	**1636_good, 1636_poor, 1636_grassland**	7.1	49.00
Petaurus norfolcensis / Squirrel Glider	**1636_good, 1636_poor**	1.2	35.00
Tyto novaehollandiae / Masked Owl	**1636_poor**	0.0	1.00

Credit Retirement Options

Like-for-like options

Diuris praecox/ Rough Doubletail	Spp	IBRA region	
	Diuris praecox/Rough Doubletail	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Lathamus discolor/ Swift Parrot	Spp	IBRA region	
	Lathamus discolor/Swift Parrot	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Endangered	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Myotis macropus/ Southern Myotis	Spp	IBRA region	
	Myotis macropus/Southern Myotis	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Petaurus norfolcensis/ Squirrel Glider	Spp	IBRA region	
	Petaurus norfolcensis/Squirrel Glider	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region

	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Tyto novaehollandiae/ Masked Owl	Spp	IBRA region	
	Tyto novaehollandiae/Masked Owl	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Wyong, Hunter, Pittwater and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Staff qualifications and experience

A6

Table A 6.1 – Staff qualifications and experience

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
George Plunkett (Botanist)	• Biodiversity Assessment Method (BAM) Assessor (Accredited Assessor no. BAAS19010) • PhD – Plant systematics, ecology and evolution • Bachelor of Science (Honours) – Ecology / Botany, University of New England (UNE), NSW • Four-wheel drive vehicle operation • Senior First Aid Certificate	George has 12 years of experience as a plant taxonomist, flora ecologist and botanist, including a PhD in plant systematics, ecology and evolution, and has a very well-developed understanding of the Australian flora.	• 2017-Current: Botanist, Travers bushfire & ecology • 2016-2017: Research Botanist, UNE • 2010-2011: Research Botanist, UNE • 2008-2009: Plant Ecologist, Ecotone Flora Fauna Consultants	• High-quality report writing • Application of the BAM and BOS • Highly experienced in botanical survey and ecological analysis • Plant identification and taxonomy • Flora and fauna assessment • Threatened species, ecological communities and endangered population surveys and analysis • Habitat tree analysis and assessment • Noxious weed identification • Tree assessment
Lindsay Holmes (Manager of Ecology)	• Bachelor of Science – Biology, James Cook University, Qld • Bush Regeneration II Certificate, Ourimbah TAFE • NSW WorkCover OHS Construction Induction • Senior First Aid Certificate • BioBanking Assessor (No. 199) • Biodiversity Assessment Method (BAM) Assessor (BAAS17032)	Lindsay has 21 years of experience as a flora ecologist and bushland regeneration supervisor and has expertise in botanical survey, ecological analysis, maintain and improve analysis, biometric analysis and geo-plotting of ecological data.	• 2007-Current: Senior Botanist, Travers bushfire & ecology • 2006-2007: Ecologist, Conacher Travers Pty Ltd • 1999-2006: Field Operations Manager, Microclimate	• Highly experienced in botanical survey and ecological analysis • Vegetation management planning • Flora and fauna assessment • Species impact statement • Threatened species, ecological communities and endangered population surveys and analysis • Preparation of BioBanking and Biodiversity Development Assessment Reports • Riparian, bushland and wetland restoration • Habitat tree analysis and assessment • Noxious weed identification and control • SULE assessment

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
Robert Sansom (Botanist)	• Bachelor of Science (Hons) Ecology, Botany – University of New England • Applied First Aid Certificate • Certified manual 4WD operator • Certified 4WD recovery	Rob is a highly experienced botanist who has participated in a large range of projects during his career. Rob has formal qualifications in ecology, aquatic botany and limnology.	• 2014-Current: Botanist, • Travers bushfire & ecology • 2009-2013: Botanist/Ecologist, • RPS Australia East • 2007- 2008: Botanist/ Ecologist Conacher Travers Pty Ltd • 1998- 2007: Botanist/ Ecologist/ Data and Project Manager, Conacher Travers Pty Ltd • 2007-2009: Botanist/Ecologist, Conacher Environmental Group Pty Ltd	• Flora surveys • Environmental impact assessment • Environmental monitoring and auditing • Aquatic botany • Vegetation management planning • Threatened species, ecological communities and endangered population surveys and analysis • Bushfire threat assessments • Species impact statements • Habitat tree analysis and assessment • Noxious weed identification and control • SULE assessment

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
Corey Mead (Senior fauna ecologist)	• Southern Cross University – B. App. Sc. • BAM Accredited Assessor (BAAS.19050) • Accredited BioBanking Assessor (No.231) • NSW NPWS – Introduction to ArcView GIS • First Aid Certificate (St John's Ambulance Service) • Class C vehicle, Boat & Divers Licences • Risk Assessment Training (Taronga Zoo) • NSW RFS – Firefighters Certificate • Report Writing – Pollack Learning Alliance • Frog, Reptile & Bat Survey, ID & Mgt Training – NSW Forestry • Anabat Techniques Training – Titley Scientific – Smiths Lake • Cert III – Building & Carpentry (assist in construction of nest boxes)	Corey has developed extensive specialist knowledge over 20 years in fauna survey techniques, threatened species target surveys, data analysis and visual and call identification of vertebrate fauna within coastal habitats of NSW.	• Nov 20 – Present – Contract Fauna Ecologist (*TreeHouse Ecology*) • Oct 07 – Nov 20 – Senior Fauna Ecologist – Travers Bushfire & Ecology • Jan 06 – Oct 07 – Field Tech / Fauna Ecologist – Conacher Travers Environmental Consultants • Feb 03 – Jan 06 – Head Reptile Keeper – Australian Reptile Park • Jan 03 – Sept 05 – Visitor Services Officer – National Parks & Wildlife Service • Dec 02 – Jan 03 – Marine Turtle Project Officer – National Park & Wildlife Service • Aug 00 – Feb 03 – Venom Room Attendant – Australian Reptile Park • Nov 99 – Feb 00 – Waste Minimisation Education Officer – Manly Council • Apr 97 – Sept 00 – Environmental Education Officer – Australian Reptile Park	• Remote and independent terrestrial vertebrate surveys • Threatened fauna target surveys & assessment • Microbat Call Identification & active monitoring • AnalookW, Anapocket, Insight & CFC Read bat analysis software • Kaleidoscope Pro song-meter clustering & classifier analysis • Advanced song classifiers for threatened owls, frogs & gliders • Squirrel Glider radio-tracking surveys • Project Ecologist during habitat clearance • Habitat tree assessment / audits • Advanced reptile captive management • Fire trail audits & bushfire risk analysis • Advanced venomous snake handling & training • Education/training program development • GPS data transfer and management • Scientific License & Animal Ethics License administration

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
Michael Sheather-Reid (Managing Director)	• Bachelor of Natural Resources (Hons), University of New England • BioBanking Assessor • Engineering Assistant – CAD Drafting • MUSIC Modelling – Stormwater quality and quantity modelling (RMIT) • Bush Regeneration II Certificate, Ryde TAFE • NSW WorkCover OHS Construction Induction • Chemical Handling Certificate, Ryde TAFE	Michael has a wealth of experience in environmental consulting and on ground management of bushland, wetland and riparian habitats having undertaken environmental assessment, ecological consultancy and restoration in both the private and public sectors for over 22 years.	• 2007- Current: Senior Ecologist, Travers bushfire & ecology • 2004 -2007: Senior Ecologist, Conacher Travers Pty Ltd • 2002-2004: Project Manager, Urban Bushland Management Projects Pty Ltd • 1999-2002: Project Manager Sustainable Vegetation Management Pty Ltd • 1995-1999: Managing Director Sheather-Reid & Associates Pty Ltd • 1996-1997: NSW Landcare Liaison Officer, Australian Conservation Foundation • 1992-1995: Environmental Officer, Dept. Land & Water Conservation • 1990-1992: Scientific Officer Dept. of Water Resources	• Ecological assessment • Rezoning studies • Biodiversity offset planning • Restoration management and coordination • Biotic and soil translocation • Watercourse assessment • Project ecologist services • EPBC Act referrals • Controlled Activity Approvals • Vegetation management plans
Sandy Cardow (GIS officer)	• Bachelor of Science (Biological Sciences) (Macquarie University)	Sandy has over twenty years of experience in Spatial Information (Geographic Information Systems (GIS)), which includes preparation of mapping in local government roles and has completed a Bachelor of Science (Biological Sciences).	• 2017 – Current: GIS Officer, Travers bushfire & ecology • 2014 – 2017: GIS Consultant, Forestry Corp. NSW • 2005 – 2011: GIS Analyst, Forests NSW • 2002 – 2005: GIS Data Librarian, Forests NSW • 2000 – 2002: GIS Operator, Forests NSW • 2000 – 2002: GIS Data Import / Export Officer, Forests NSW • 1999 2000: GIS Project Officer DECC • 1998 – 1999: GIS Support Officer DECC • 1998 – 1999: Wildlife Atlas Data Entry Officer DECC	• Geographic Information Systems • Data management and analysis • Spatial databases and database administration • GPS • Cartography • Natural resource management • Client liaison

Team member (role)	Accreditations and qualifications	Experience	Employment history	Skills and expertise
Nathan Stewart (Fauna Ecologist)	• Bachelor of Environmental Science and Management (University of Newcastle) (2016-2019)	Nathan has experience in fauna survey techniques and visual and call identification of vertebrate fauna within coastal habitats of NSW.	• 2019 – Current: Fauna Ecologist, Travers bushfire and ecology. • 2019: Volunteer at Australian Museum in the herpetological department.	• Report Writing • Fauna Field Assessments • Project Ecologist during habitat clearance and installation of nest boxes • Habitat tree analysis and assessment
Geoff Coates (Fauna ecologist)	• Bachelor of Zoology (Animal Ecology) (University of New England) (2011-2013) • Bachelor of Science (Honours) (University of New England) (2014) • Venomous Snake Catch and Release Certification • Chemical Certification	Geoff has experience in vertebrate fauna identification and survey techniques, report writing, aquatic sampling, weed control and laboratory work. For his honours project, he utilised engineering software to determine the structural integrity of mammalian carnivore skulls.	• 2020 – Current: Fauna Ecologist, Travers Bushfire and Ecology • 2018 – 2020: Research Support Officer/Research Agronomist, Kalyx Australia • 2017: Green Army Team Leader, ET Australia • 2015 – 2016: Project Officer/Casual Academic, University of Newcastle	• Fauna identification and surveying • Project management • Report writing • Data collation and analysis • Liaising with clients, landowners, universities, government agencies and field staff • Weed management in both conservation and agriculture • Collecting environmental samples including soil, water, plant tissue and invertebrates for stable isotope analysis • Supervising and instructing undergraduate environmental science students in practicals and university field trips
Bronte Talbot (GIS officer / ecologist)	• Bachelor of Environmental Science and Management (University of Newcastle) (2016 - 2018) • Currently studying - Master of Environmental Science specialising in Water Resource (Charles Sturt University)(2020-present)	Bronte has experience in Geographic Information Systems (GIS), Watercourse Assessments, Report Writing and Field Work procedures. She aims to specialise in Water Resources and assist communities adopt sustainable practices and help create water security.	• 2019 to present Travers Bushfire and Ecology • 2018 volunteer at Verico Group	• Geographical Information Systems (GIS) • GPS • Report Writing • Watercourse Assessments • Flora and Fauna Field Assessments • Vegetation Management Plans • Environmental Monitoring (Air quality – Ambient Gaseous, Ambient Particulate and water sampling)

Report on Masked Owls (John Young)

A7

Report on the "Chain Valley Bay"

Masked Owls

By

John Young

(Wildlife Consultant and large forest Owl specialist.)

Chain Valley Bay Site, Subject to a Development Proposal

Background

On the eve of 27th June 2019 soon after dusk, Mr Corey Mead of Travers Bushfire and Ecology, a senior Fauna Ecologist, suspecting suitable habitat (several large hollows and mosaic understorey structure) attracted a single Masked Owl by mimicry of the bird's call. The owl approached quietly within minutes of Corey's call and landed on a branch overhead.

Given that this bird arrived rapidly and just after dusk, it was clearly occupying the site and surrounds. The bird was confirmed at the time in torch light as Corey was quite familiar with the species, having worked with many other pairs.

Following this event Mr Mead surveyed the site in the vicinity for all suitable hollows and one in particular stood out as being centrally located within the others and suitable for nesting at point Lat: 33° 14' 44.72881"S – Long: 151° 34' 45.30851"E.

A number of other hollow bearing tree's suitable for roosting were also discovered within a 300m radius of the suspected nest tree.

Suspected nest tree for Masked Owls discovered by Corey Mead. Typical site.

30th August

On August 30th 2019, I visited the site with Mr Mead for a brief look at the location and all potential use trees identified along with a brief from him of what he had seen and heard.

Later in the afternoon I returned again to within 30 metres of the suspected tree and stayed till well after dark in heavy rain. A useless night as very few owls call when in heavy rain, instead they often sit motionless and quiet. Not surprisingly, not a sound was heard, nor was there any sign of the bird so I departed at 7.55pm.

31st August

Morning session - I arrived at the site at 3.45am, again in pouring rain and positioned myself across the creek at the same spot and waited until daylight.

Still not a sign or sound, so I departed at 6.30am.

Evening session - Once again I arrived at the same spot in heavy rain at 5.15pm.

This time the rain eased and after a long wait a Masked Owl arrived from the east at 7.27pm, cackling softly as it approached with what appeared to be something in its bill.

It did not go to the obvious hollow but, instead went to the dead hollow upright in the centre of the tree and went in.

Entrance to Masked Owl nest – 31st August 2019

I expect that both entrances to the hollow will join up. I stayed in position as the rain got heavier but, did not see the bird come out. I departed at 8.21pm.

There is no doubt that this tree is the nesting site of the pair and most likely has been for many years.

1st September

Morning session - Again, I arrived at the site close to the discovered nest tree at 4.05am in very light rain with clearing skies. Not a sound nor sign of anything until 5.06am then there was a call approximately 200 m to the south east. Seemingly the last call of the night before going to roost in a hollow.

I spent many hours going over the site during the day, looking at all the possible hollows that Mr Mead had discovered and marked, and one in particular seemed to be in line with where I heard the call on daylight, so I decided to come back in the late evening and sit half way between the two discovered sites.

Showing typical Masked Owl habitat midway between nest site and discovered roost tree

Evening session - I arrived again at the planned site at 5pm and waited.

6.05pm in dim light the male called directly at the suspected roost tree and on my approach, he was clearly visible on a horizontal branch, just out from the hollow preening.

A roost tree at Lat: 33° 10’ 46.72024”S – Long: 151° 34’ 52.36077”E is confirmed.

Within 5 minutes he flew overhead, directly towards the discovered nest tree, cackling softly as he went. He did not have food but was visiting the female.

No further sound was heard so I departed under relatively clear skies at 7.45pm.

2nd September

Morning session - I arrived back near the nest tree at 3.48am and sat quietly close to the tree and heard nothing. Not a sound or even a sighting of the bird.

These birds become so quiet and secretive when they have young (which I believe they had from 40 years of experience in viewing many nest sites). From normal behaviour of some pairs, you would not know that they even existed in the area.

I departed at 6.10am.

Evening session - Again, I sat just across the creek from the discovered nest tree before dusk and waited. This time under very clear skies.

At 6.28pm in dim light the male appeared, seemingly from nowhere, I was lucky to see him. He landed on the rim of the main entrance to the hollow, chuckled softly for a few seconds, then flew south up over the canopy calling once in flight well off in the distance as he went hunting.

With no further sound I departed at 8pm.

3rd September

Last morning session - I arrived again near the nest tree under clear skies at 4.21am and waited until daylight without hearing or seeing the bird. Not surprising when these birds have young as they will often come in towards midnight with food, then no more.

Conclusion

The map below shows the locations of all large hollows with potential use, from Corey Meads initial survey work. The authors work has followed on to confirm those findings of suitable hollows, the nest tree and a roost tree.

I expect that the recorded breeding pair of Masked Owls have occupied this area at Chain Valley Bay for many years. The identified nest tree is central to this activity and very important for protection with appropriate buffers.

One hollow was also confirmed as a roost site, however a number of others located by Mr Mead are also potential roost sites. I have taken a precautionary approach to ensure each of these also receive appropriate buffers from development and activity.

The forested habitat surrounding the breeding area is extensive, so provided that these buffers are enforced with some additional measures to screen out development and future activity, I believe the birds will continue to remain here.

Recommendations

I have taken the approach that the prescriptive buffers of 100m from a nest tree and 50m from a roost tree be applied to the trees identified.

I am recommending that the “blue” line on the following map is the southern boundary of the proposed development to incorporate the nest tree and a potential roost tree buffers within a protection zone. This outer area should be heavily revegetated with local dense foliage plants to act both as a sound and light barrier. This area may include the stormwater detention basin for the development provided that the same extent of vegetation is planted on either side to permit the sound and light barrier.

Special thanks to Corey Mead for his excellent field work and support during the survey.

Also, to Michael Sheather-Reid, Managing Director of Travers Bushfire and Ecology for his strong support.

John Young.

12th September 2019


Legend
Study Area
Initial Subject Site
Modified southern development boundary for Masked Owl
Closest potential roost tree buffer
Suspected nest tree buffer
Dimensions
Recorded large hollows potentially utilised by Masked Owl
Recorded use by Masked Owl
Good quality hollow
Other
Male Roost Tree
Confirmed Nest Tree
MULLOWAY ROAD
CHAIN VALLEY BAY ROAD
50m
100m
50m
Confirmed Nest Tree
Masked Owl
Confirmed Roost 1
0
40
80 m
Document Path: N:\GIS STORAGE\N Drive\18CP02_45_MullowayRd_ChainValleyBay\MXDs\18CP02_FF002_JohnYoung.mxd

Invitation to Council for comment

A8

George Plunkett

From: Tom Copping <tom@vivacityproperty.com.au>
Sent: Thursday, 4 February 2021 9:06 PM
To: Rod Mergan
Cc: Scott Duncan; Jenny.Mewing@centralcoast.nsw.gov.au; gavin@coastplan.com.au; Michael Sheather-Reid; Lindsay Holmes; George Plunkett
Subject: 45 Mulloway Road - Biocertification Referral
Attachments: 18CP002BCA 45 Mulloway Rd Chain Valley Bay FINAL.pdf; 45 Mulloway Rd - Biodiversity Certification Referral.pdf

Hi Rod

Please find the attached referral letter and Biocertification application for Council's review and comment.

Some additional surveys have been completed to firm up the application however the findings and recommendations are consistent with the previous reports provided to Council prior to Gateway.

If you would like to discuss please feel free to contact me.

Regards

Vivacity

Tom Copping
Planning Manager

m. +61 425 555 383 **e.** tom@vivacityproperty.com.au
Level 54, Governor Phillip Tower,1 Farrer Place, Sydney NSW 2000
vivacityproperty.com.au

Council's submission

A9

George Plunkett

From: Matthew Hingee <Matthew.Hingee@centralcoast.nsw.gov.au>
Sent: Friday, 26 February 2021 10:44 AM
To: George Plunkett
Cc: Rod Mergan
Subject: RE: 45 Mulloway Rd BCAR

Sensitivity: Confidential

Hi George,

Yep you're correct I was looking at 15 Mulloway Rd. The 45 Mulloway Rd BCAR had a subject heading '18CP02' so I looked passed this one.

The BAM calcs look all good to me so the outstanding comments are as follows:

- None of the required shape files or supporting spatial data have been submitted with the BCAR or through the BOAMS portal. Please submit this data in accordance with Appendix K of the BAM.
- Avoid and minimise criteria would be strengthened by altering the proposed layout to avoid direct impacts to PCT 1718 EEC vegetation and mapped important Swift Parrot areas. This is an important consideration considering the species is an SAII species and would also further reduce the credit offset obligation for the proposal.
- The proposed E2 zoning is inconsistent with the recommendations of the Biodiversity Conservation Division.

Please disregard the 2 two points that relate to resubmission of revised BAM calcs in BOAMS.

Cheers,

Matt

Please be advised that although Council continues to operate business hours through the developing Covid-19 situation, it is likely that Council Staff may be required to intermittently or permanently work from home or outside of the office. During this time the preferred communication method is via email. If you wish to speak to a staff member, please email the relevant staff member to advise that you request a call back, and they will contact you via email and return phone call.

Matthew Hingee
Strategic Environment Planner
Environmental Strategies
Central Coast Council
P.O. Box 21 Gosford, NSW 2250
t: 02 4325 8269
e: Matthew.Hingee@centralcoast.nsw.gov.au

Please consider the environment before printing this email

From: George Plunkett <gplunkett@traversecology.com.au>
Sent: Friday, 26 February 2021 10:02 AM
To: Matthew Hingee <Matthew.Hingee@centralcoast.nsw.gov.au>
Subject: RE: 45 Mulloway Rd BCAR
Sensitivity: Confidential

Hi Mat,

I have just received Council comments on 45 Mulloway Rd, Chain Valley Bay via the client. Some are a bit confusing to me and I'm wondering if you may have confused two separate BCAR proposals. One is for 45 Mulloway Rd, the other is 15 Mulloway – completely unrelated projects through different clients. They were both "submitted to the consent authority" at the same time. Can you please check that the case you have reviewed is for 45 Mulloway Rd, case number: 00014301/BAAS19010/19/00014302

Cheers,

George Plunkett
Botanist
B.Sc. (Hons), PhD.
Accredited Assessor no. BAAS19010

P: 1300 896 998

E: servicedesk@traversecology.com.au

W: traversecology.com.au

WE ARE ECOLOGISTS NOT ACCOUNTANTS, BUT WE VALUE YOUR BUSINESS AND YOUR TIME

From: Matthew Hingee [mailto:Matthew.Hingee@centralcoast.nsw.gov.au]
Sent: Monday, 15 February 2021 3:24 PM
To: George Plunkett <gplunkett@traversecology.com.au>
Subject: RE: 45 Mulloway Rd BCAR
Sensitivity: Confidential

Response to Council's submission

A10

Our ref: 18CP03BCA
Your ref: DOC20/782884-1

10 March 2021

Steven Cox
Senior Team Leader Planning
Hunter Central Coast Branch
Biodiversity and Conservation Division
Department of Planning, Industry and Environmer
Level 4/26, Honeysuckle Drive
Newcastle NSW 2309

Attention: Steven Cox

Dear Steven

Re: Biodiversity Certification Application at 45 Mulloway Road, Chain Valley Bay

Travers bushfire & ecology prepared a Biodiversity Constraints Assessment (BCA) dated 24 September 2019 in association with a planning proposal and Gateway Determination for a manufactured home estate at 45 Mulloway Road, Chain Valley Bay (Lot 5 DP 1228880). This BCA included a specialist report from John Young regarding Masked Owls recorded on the property.

Advice was provided by the Biodiversity and Conservation Division (BCD) on the proposal and Biodiversity Constraints Assessments (2019) in a letter addressed to Rod Mergan of Central Coast Council dated 15 October 2020. That letter provides comments and recommendations for the planning proposal and associated BCA. The BCA has now been superseded by a Biodiversity Certification Assessment Report (BCAR), which has been prepared in light of BCD's recommendations. Some of these recommendations are now irrelevant or obsolete. The attached Table 1 identifies recommendations that are still relevant to the BCAR and provides responses to those recommendations.

Central Coast Council's ecologist Mathew Hingee has also provided commentary on the Biodiversity Certification Assessment Report. These comments were provided in an email from Mr Hingee dated 26 February 2021. This email is treated here as the council submission to be addressed as part of the Biodiversity Certification Application, and this letter is our response. We have undertaken appropriate actions is response as detailed in the attached Table 1.

If you require any further information please do not hesitate to contact the undersigned on (02) 4340 5331 or at info@traversecology.com.au

Yours faithfully

Michael Sheather-Reid | *Managing Director*
BAM Accredited (BAAS17085)
(B. Nat Res. Hons)

P: 1300 896 998

E: servicedesk@traversecology.com.au

W: traversecology.com.au

Attachments:

Table 1 – Response to matters raised by Council
Figure 1 – Width of east–west corridor

Table 1 – Response to matters raised by Council

Council comment	***Travers bushfire & ecology* response**
1. None of the required shape files or supporting spatial data have been submitted with the BCAR or through the BOAMS portal. Please submit this data in accordance with Appendix K of the BAM.	Currently, the BOAMS portal does not allow the uploading of shape file or compressed folders. The only supported file types are: pdf, doc, docx, xls, xlsx, csv, jpeg, png, gif. We will provide the required files to the BCD via email.
2. Avoid and minimise criteria would be strengthened by altering the proposed layout to avoid direct impacts to PCT 1718 EEC vegetation and mapped important Swift Parrot areas. This is an important consideration considering the species is an SAII species and would also further reduce the credit offset obligation for the proposal.	The proposal will impact on 0.08 ha of Mapped Important Habitat Areas for Swift Parrot. The SAII assessment provided in the BCAR states that this impact may remove a few winter-flowering feed trees (*Eucalyptus robusta*), but will not directly impact on individual Swift parrots. The BCAR states that the proposal will not likely cause an SAII on this species.
3. The proposed E2 zoning is inconsistent with the recommendations of the Biodiversity Conservation Division.	Council has confirmed via phone to Vivacity Property that the plan has been endorsed with the current E2 boundary, which is consistent with the structure plan. No further information or clarification was requested.
BCD comment on the Biodiversity Constraints assessment	
1. BCD is satisfied that the inconsistency with Section 9.1 Ministerial Direction (2.1) Environmental Protection Zones is minor The planning proposal recommends a change from an E3 (Environmental Management) zone to RE2 (Private Recreation) and E2 (Environmental Conservation). For the part of the property which is being changed from an environmental zone to a recreation zone, this is a reduction in the protection afforded to an environmental zone, and the planning proposal is therefore inconsistent with the terms of Section 9.1 Ministerial Direction 2.1 (Environmental Protection Zones). However, Biodiversity Conservation Division (BCD) is satisfied that this inconsistency with Section 9.1 Ministerial Direction 2.1 is minor as the area where the environmental protection will be reduced is already predominantly cleared. Also, it is expected that the development footprint can be redesigned to reduce the impacts on biodiversity, without affecting the viability of the project. Recommendation 1 BCD is satisfied that the inconsistency with Section 9.1 (2.1) Environment Protection Zones is minor and can be justified.	Noted - no action required.

2. Further ecological assessment is required to inform the development footprint The Travers (2019) ecological report states that the level of assessment undertaken in the vegetated areas in the southern part of the property was 'very restricted' and that further survey is required for several threatened species including threatened orchid species, koalas, squirrel gliders, wallum froglets and other threatened fauna in order to inform the development design. The report lists hollow-bearing trees, winter-flowering Eucalypts, Allocasuarinas, swamp sclerophyll forest (an endangered ecological community), koala feed trees, the riparian zone and other high environmental values as being present on the subject site. Threatened species including four microbats (east-coast freetail-bat, large-footed myotis, little bentwing-bat, and eastern bentwing-bat), and masked owls were recorded on site during the surveys. Biodiversity Conservation Division (BCD) expects that with further threatened species surveys more high environmental values will be recorded in the southern part of the site. Recommendation 2 BCD recommends that further ecological surveys are conducted to inform the development footprint.	Further ecological survey has been undertaken in accordance with the BAM and for the purposes of the BCAR. Survey methodology and limitations are detailed in Section 2 of the BCAR. For candidate species where survey is not sufficient to demonstrate absence, they have been assumed present for the purposes of the BCAR.
3. BCD recommends further consideration of the masked owl nest and roost trees There is a masked owl nest tree and roost trees within the southern portion of the subject site. This area is generally within the proposed E2 zone and is also part of the Green corridor and habitat network provided in the North Wyong Shire Structure Plan and Central Coast Regional Plan. However, the specialist report provided (Young 2019) recommends buffer areas from these nest and roost trees and reconsideration of the positioning of roads to protect the masked owl's breeding habitat. The recommended buffer areas will encroach slightly on the area earmarked for an RE2 zone, i.e. for development. Recommendation 3 BCD recommends that the development footprint is reduced to accommodate the masked owl breeding habitat in accordance	The development footprint has been designed in consideration of the specialist owl report from John Young, which states: *"I have taken the approach that the prescriptive buffers of 100m from a nest tree and 50m from a roost tree be applied to the trees identified.* *I am recommending that the "blue" line on the following map* [attached below] *is the southern boundary of the proposed development to incorporate the nest tree and potential roost tree buffers within a protection zone. This outer area should be heavily revegetated with local dense foliage plants to act both as a sound and light barrier. This area may include the stormwater detention basin for the development provided that the same extent of vegetation is planted on either side to permit the sound and light barrier."*

with the owl specialist's recommendations.	The Concept Masterplan allows for the recommended buffers to both roost and nesting trees and we note that the specified buffers are to exclude any lots and associated public access. Although the proposed RE2 zone will encroach slightly on these buffers, the masterplan shows that this encroachment will only contain an APZ and a sedimentation basin. The APZ setback to the forested vegetation to the south will exclude any residential development within the buffers. We also note that the advices from John Young only specifies revegetation along the outer area of the buffer area. This is to provide a light and sound screen for foraging by Masked Owls, which will utilise the cleared edge of the forest in the southern study area (as stated in Section 4.3 of the BCAR). The retention of the cleared areas adjacent to denser vegetation is considered important to maintain its foraging behaviour. The design is consistent with the expert advice, provided the additional management actions are instigated (i.e. screening vegetation and speed limit enforcement). The BCAR provides detailed assessment of impacts on masked Owl.
4. BCD recommends widening the proposed E2 corridor to align with the E2 zones on the adjoining properties Planning and Assessment have stated in the Gateway Determination that the planning proposal is to be updated to "confirm the width of the proposed E2 Environmental Conservation zone to align with the position of environmental zones on adjoining land, which together must form an appropriate biodiversity corridor for the area". Further, council's assessment of the planning proposal states that the corridor in the south of the site provides interregional landscape connectivity. Biodiversity Conservation Division (BCD) has also mapped the vegetation in the southern part of the subject site as the northern boundary of a regionally significant corridor and therefore recommends that the proposed E2 area on this property is aligned with the E2 zone from the adjoining properties to the east and west. This would incorporate the high environmental values associated with the soaks of the Tacoma Swamp soil	The E2 boundary has been designed to include existing connective values provided by the remnant vegetation in the south of the site. These connective values will be fully retained under the proposed biodiversity certification. The area directly to the north of the E2 boundary will mostly contain the APZ zones or be used for water quality management (detention basin). These areas provide a buffer to the corridor. Although they will remain largely non-vegetated, they serve a role in preserving the existing corridor and will achieve similar ecological outcomes under the proposed RE2 zoning. The extension of the conservation zone would imply that these areas, which are currently cleared and used for rural purposes, have some conservation value, which is not the case. Revegetation would have a significant impact on the proposal through larger APZs. The fringing cleared edge provide fringing foraging habitat suitable for the foraging behaviour of Masked Owls. As discussed above in response to Recommendation 3, the complete revegetation of the fringing

landscape and the Wyong alluvial soils into the corridor to provide connectivity across the landscape. Some rehabilitation may be required to enhance the corridor. An increased corridor width would also provide additional protection for the masked owl. Recommendation 4 BCD recommends that the proposed E2 zone is aligned with the E2 zone on adjacent properties.	edge would alter or remove this foraging utility. The widening of the E2 zone and corridor will have a negligible effect on connective values. Figure 1 shows the east–west corridor that includes the southern part of the subject land. The width of the corridor at the subject land is approximately 800 m, whereas the narrowest point to the west is less than 90 m. Extension of the proposed E2 zone would increase the corridor width to around 900 m at the location of the subject land, but would have no effect on the minimum connective width of the corridor.
5. The assessment of koala habitat will need to be updated in accordance with the new SEPP (Koala Habitat Protection) 2019 The ecological assessment included an assessment of koala habitat under State Environmental Planning Policy 44 (SEPP 44). The report indicated that the trees on the site are the koala feed trees Eucalyptus haemastoma (Scribbly Gum) and Eucalyptus robusta (Swamp Mahogany) and comprise more than 15% of the trees on site. An assessment under the new SEPP (Koala Habitat Protection) 2019 will be required for the development application stage. Planning and Assessment have stated in the Gateway Determination that the planning proposal is to be updated in accordance with the new SEPP (Koala Habitat Protection) 2019. Biodiversity Conservation Division (BCD) also recommends that the koala assessment is updated. Recommendation 5 BCD recommends that an assessment under the new SEPP (Koala Habitat Protection) 2019 is now undertaken.	This recommendation is now out of date following the commencement of the Koala SEPP 2020, which replicates the objectives and provisions of SEPP 44. The BCAR includes assessment under the Koala SEPP 2020.
6. Offsetting will be required at the DA stage Planning and Assessment have stated in the Gateway Determination that the planning proposal is to be updated to identify offsetting requirements prior to public exhibition. The site is affected by the Biodiversity Values Map prepared by the NSW Department of Planning Industry and Environment under Part 7 of the Biodiversity Conservation Act 2016, and the proposed impacts on 0.32 hectares of Swamp Sclerophyll Forest Endangered Ecological Community and 0.92	The prepared BCAR includes a biodiversity offset credit assessment which identifies all offsetting requirements for the proposal, in accordance with the BAM. This has all been prepared and finalised prior to public exhibition.

hectares of Narrabeen Doyalson Coastal Woodland will exceed the clearing threshold which triggers the Biodiversity Offset Scheme. While there is no formal requirement to provide offsets at the planning proposal stage the proponent will need to meet their offset obligations through the retirement of credits in accordance with the Biodiversity Assessment Method at the development application stage. Biodiversity Conservation Division (BCD) also recommends that offsetting requirements are identified prior to public exhibition. Recommendation 6 BCD recommends that offsetting requirements are identified prior to public exhibition.	
7. The proposal is not consistent with the North Wyong Shire Structure Plan The proposal will place new manufactured homes within the 1% Annual Exceedance Probability (AEP) flood extent. The proposal seeks to rezone a portion of Lot 5 DP 1228880 from E3 to RE2 (Private Recreation) to support a future manufactured home estate. The site's location is included in the Lake Macquarie Catchments Overland Flood Study which is currently being prepared by BMT for Central Coast Council. This study shows that there is an overland flow path along the western boundary during a 1% AEP local catchment flood event. This overland flow path extends into the proposed RE2 zone area. The North Wyong Shire Structure Plan (NWSSP) states that 'A key principle applied to the Structure Plan has been to not intensify land use in areas that could be at risk from increased flooding'. Creating small lots for occupation in the area identified as floodway will intensify development in a floodplain – leading to increased flood risk and potential flood damages to residents. Recommendation 7 BCD recommends that the RE2 zone boundary is adjusted so that it remains outside of the 1% flood extent identified in the Lake Macquarie Catchments Overland Flood Study.	The overland flooding will be addressed during the design phase. Preliminary advice indicates that the flooding is minor and can be addressed by water management measures such as swales to contain any flows within setback areas. This is a matter for assessment and approval by Council on this aspect of the proposal. An engineer's report is being prepared for Council to address this issue. Council has agreed with this approach, and the zone boundaries have been endorsed by Council as per the proposal.

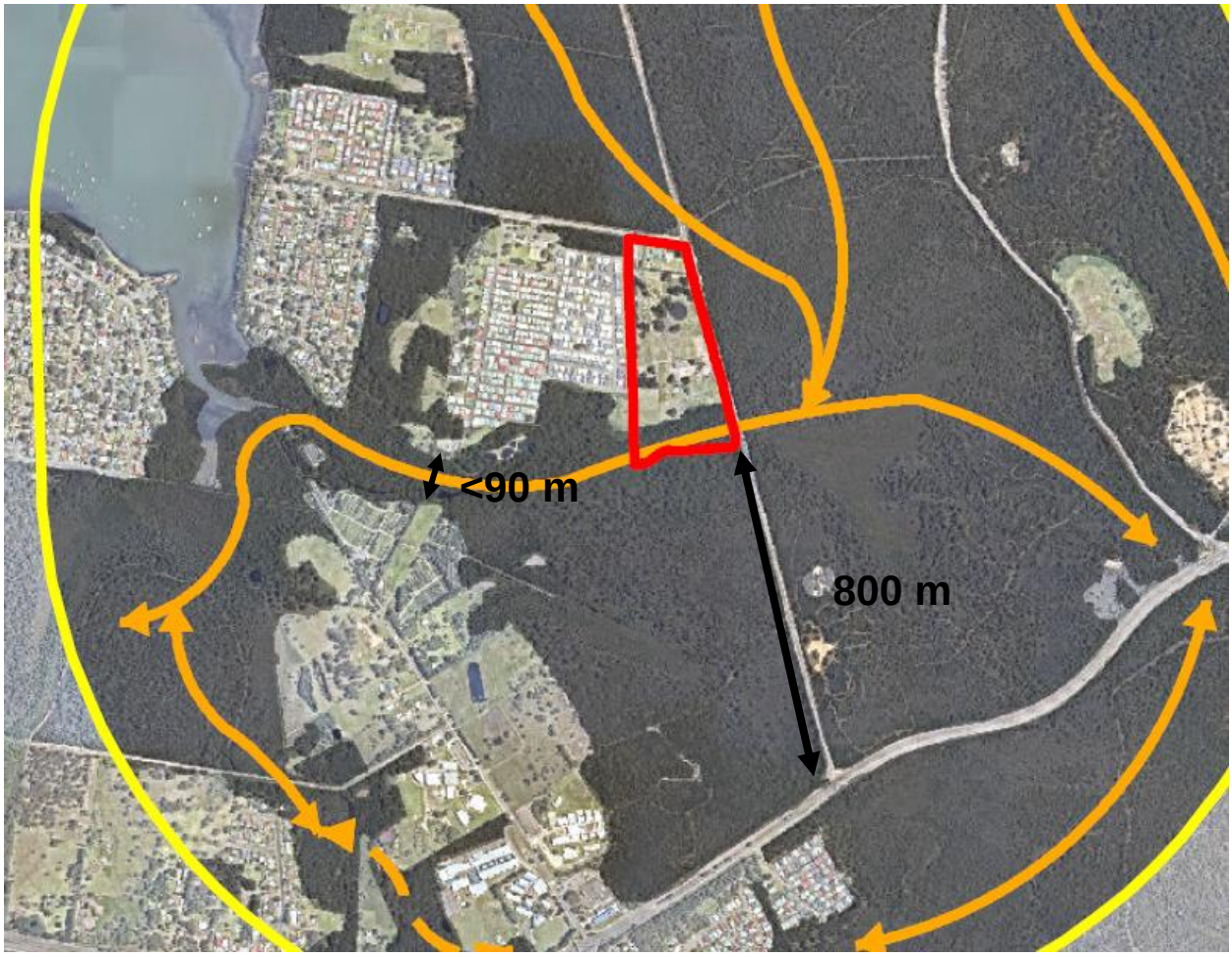

Figure 1 – Width of east–west corridor

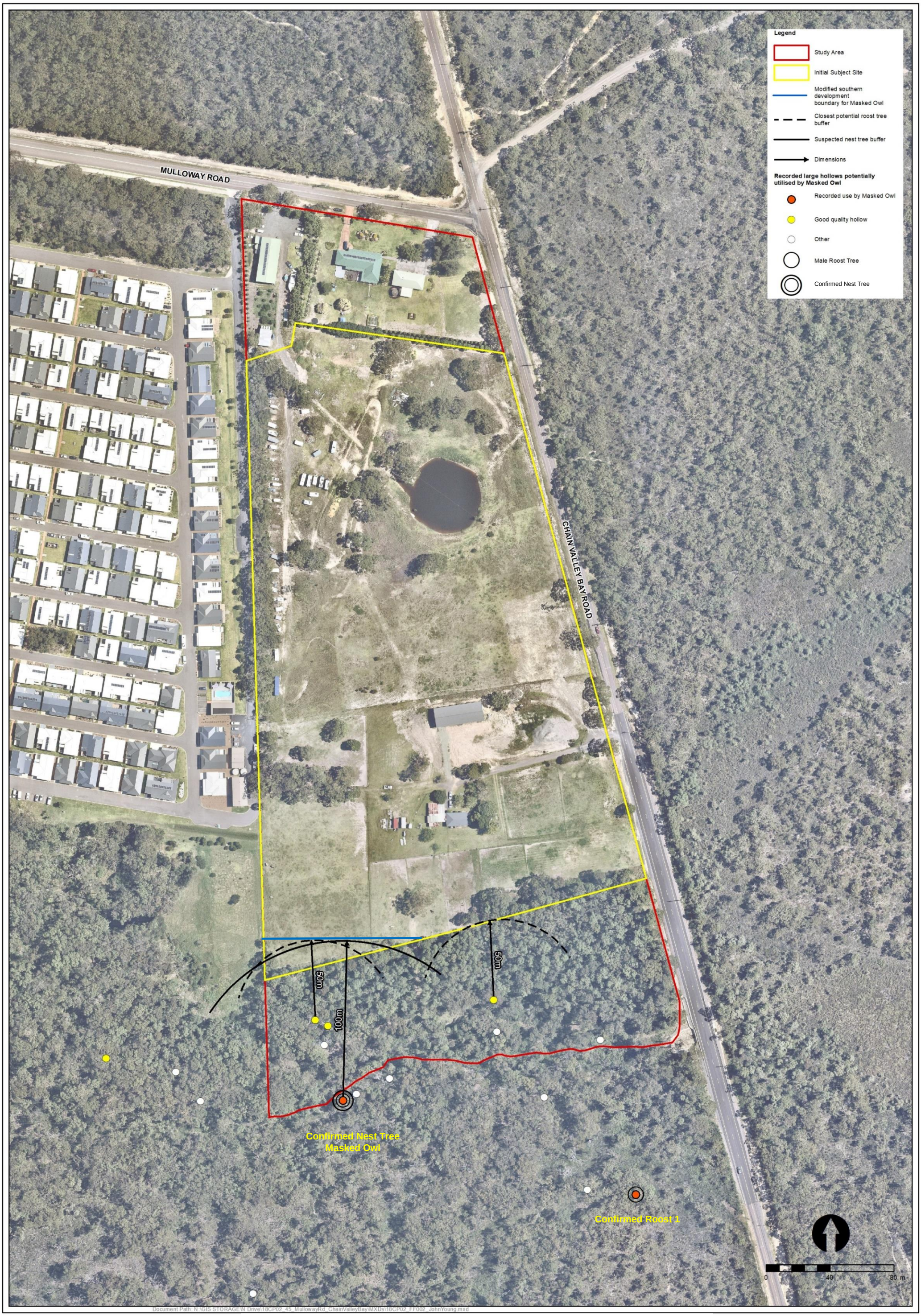

Figure 2 – figure referred to in owl report by J. Young

BCD Comments A11

Our ref: DOC21/190387-3

George Plunkett

Travers Bushfire and Ecology
gplunkett@traversecology.com.au

Dear George

45 Mulloway Road - Biodiversity Certification Application

I refer to the Biodiversity Certification Application for 45 Mulloway Road Chain Valley Bay. Biodiversity and Conservation Division (BCD) has reviewed the Biodiversity Certification Assessment Report and Application Form. BCD's detailed comments and recommendations are provided in **Attachment A**. Once BCD is satisfied that our recommendations have been adequately addressed, BCD will notify you that the BCAR is ready for you to publicly exhibit.

I encourage you to consult with BCD as you address the recommendations in the attachment. If you require any further information regarding this matter, please contact Brendan Mee, Senior Conservation Planning Officer, on 4904 2730 or via email at huntercentralcoast@environment.nsw.gov.au

Yours sincerely

21 May 2021

STEVEN COX
Senior Team Leader Planning
Hunter Central Coast Branch
Biodiversity and Conservation Division

Enclosure: Attachment A

BCD's recommendations

45 Mulloway Road, Chain Valley Bay – Biodiversity Certification

Biodiversity

1. The BCAR should state whether BAM 2017 or BAM 2020 is proposed to be used

The Biodiversity Certification Assessment Report (BCAR) does not outline whether Biodiversity Assessment Method (BAM) 2017 or BAM 2020 is being used for the assessment. The consultant has subsequently indicated that BAM 2020 is proposed to be utilised, however this should be outlined within the BCAR.

Recommendation 1

The BCAR should outline whether BAM 2017 or BAM 2020 is proposed to be used.

2. The E2 corridor should be amended to align with the E2 zones on the adjoining properties

The Gateway Determination for the planning proposal states that the proposal should be updated to "confirm the width of the proposed E2 Environmental Conservation zone to align with the position of environmental zones on adjoining land, which together must form an appropriate biodiversity corridor for the area". Further, council's assessment of the planning proposal states that the corridor in the south of the site provides interregional landscape connectivity.

Extension of the E2 boundary to align with the adjoining properties will ensure there is a greater buffer to the EEC community and the threatened species habitat and will assist to mitigate the impacts of edge effects on threatened species such as the swift parrot, masked owl, squirrel glider, eastern pygmy possum and southern myotis as well as minimise prescribed impacts on this area such as hydrological impacts.

Recommendation 2

The E2 corridor should be amended to align with the E2 zones on the adjoining properties in accordance with the Gateway Determination for the planning proposal.

3. Further assessment of edge effects on the swamp sclerophyll forest EEC is required

The proposal is likely to result in edge effects on the swamp sclerophyll forest on coastal floodplains Endangered Ecological Community (EEC) and associated threatened species habitat. Edge effects include those associated with noisy miner competition, stormwater detention basins, road works, potential hydrological changes from stormwater discharge, introduction of weeds and feral animals, impacts from domestic pets, human disturbance, dumping of materials and increased spill-over from noise, activity, scent and lighting.

This area of vegetation contains very high biodiversity values, including it being mapped as an EEC, it being squirrel glider habitat and it containing important winter foraging resources for a number of species, including the swift parrot. Competition from noisy miners and predation by cats are key threats to the swift parrot. It is important that edge effects on this habitat are minimised.

There are also a number of large swamp mahogany trees that are proposed to be cleared. A key management action specified in the Threatened Biodiversity Data Collection (TBDC) for

the swift parrot is to retain stands of winter-flowering feed-trees. These trees represent important winter foraging habitat and should be contained within an additional buffer to the EEC vegetation.

Recommendation 3

BCD recommends the proposal is amended to address the potential for edge effects on the swamp sclerophyll forest EEC and an additional buffer is created around the large swamp mahogany trees that are currently proposed to be cleared.

4. Further measures for mitigation of indirect impacts are required

The development is likely to result in indirect impacts on the EEC community and threatened species within this area, including swift parrot, masked owl, squirrel glider, eastern pygmy possum and southern myotis. This includes impacts associated with noisy miner competition, stormwater detention basins, road works, potential hydrological changes from stormwater discharge, introduction of weeds and feral animals, impacts from domestic pets, human disturbance, dumping of materials and increased spill-over from noise, activity, scent and lighting. Section 6.2 of the BCAR lists a number of mitigation measures, however it does not address all of these potential impacts. Mitigation measures should be proposed to minimise all of the potential indirect impacts associated with the development. For example, development control measures should be proposed to manage impacts such as increased domestic cat and dog presence and predation.

Recommendation 4

Further mitigation measures should be proposed to minimise all the potential indirect impacts associated with the development.

5. Further justification for the selection of PCTs is required

Section 3.1.3 of the BCAR outlines the evidence used to identify a Plant Community Type (PCT), however this section excludes consideration of PCT1619 for zones 1 & 2 and excludes consideration of PCT1721 for zone 3. These PCTs have been allocated to similar vegetation communities on a site nearby on Mulloway Road.

If PCT allocations are amended, the list of candidate threatened species should be reviewed based on the new PCTs.

Recommendation 5

Further justification should be provided for the selection of each PCT in the BCAR, including consideration of PCT1619 and PCT1721.

6. There is inconsistency in PCT information in the BCAR

There is inconsistency between the information within Table 3.2, which states that PCT 1636 and PCT 1824 were shortlisted as PCTs for Zones 1 and 2 and the text below, which states that PCT 1619 and PCT 1824 were shortlisted as PCTs for Zones 1 and 2.

Recommendation 6

The BCAR should be amended to correct the inconsistencies in the method described for allocating PCTs within Section 3.1.3.

7. All native vegetation should be included in PCT mapping

A narrow strip of native vegetation along the entry road on the western side of the property has been excluded from the PCT mapping. This native vegetation should be included in the PCT

mapping and in the calculations of vegetation to be cleared and species credit species polygons. Species credit calculations should then be amended and the BAM calculator re-run.

Recommendation 7

The native vegetation adjacent to the access road on the western site of the property should be included in PCT mapping and species polygons and clearance calculations should be amended in the BCAR.

8. Zone boundaries require review

A small patch of vegetation in the south-western corner of the site has been allocated to Zone 2, Scribbly Gum – Red Bloodwood community (PCT 1636), however this vegetation consists of swamp mahogany trees and should be included within Zone 3 (PCT 1718 - Swamp Mahogany – Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast).

Recommendation 8

The PCT allocation for the vegetation in the south-western corner of the site should be changed from PCT 1636 to PCT 1718 due to the presence of swamp mahogany trees.

9. Targeted flora surveys may not be sufficient

The BCAR does not specify the width that parallel belt transects were undertaken for targeted threatened flora surveys. It appears from Figure 2.3 that a width of approximately 20 metres has been used for the swamp sclerophyll forest (PCT 1718, Zone 3) and up to 50 metres for Zone 4, which is not sufficient to detect many of the species targeted. Section 4.2 of *Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method* (2020) outlines the required widths for parallel field traverses, which is five metres for orchids, grasses, aquatic plants, epiphytes, ferns, herbs and forbs in dense vegetation and 10 metres in open vegetation.

Recommendation 9

BCD recommends the BCAR specify the width of parallel belt transects undertaken for targeted flora surveys and that they are in accordance with the BAM requirements outlined in *Surveying threatened plans and their habitats: NSW survey guide for the Biodiversity Assessment Method* (2020) or further surveys are undertaken to meet the BAM requirements.

10. Ecosystem credit species that have been excluded erroneously should be included

A number of ecosystem credit species generated by the BAM-C have been excluded from the candidate species list, including black bittern, black-chinned honeyeater, gang-gang cockatoo, golden-tipped bat, grey-crowned babbler, painted honeyeater, speckled warbler and yellow-bellied glider.

The BCAR states that this is because of the absence of recent records within 10 kilometres and that they were not recorded in surveys. This is not a relevant criteria within the BAM to remove a species from the candidate list. Section 5.2 of the BAM outlines the criteria to be used to confirm candidate species. Species can be excluded if habitat constraints listed in the TBDC are not present or the species is a vagrant in the IBRA subregion. This does not apply to any of these species that have been excluded except the painted honeyeater.

Recommendation 10

BCD recommends that the BCAR is amended to include the following ecosystem credit species as candidate species: black bittern, black-chinned honeyeater, gang-gang

cockatoo, golden-tipped bat, grey-crowned babbler, speckled warbler and yellow-bellied glider.

11. Incorrect criteria have been used to exclude species credit species

A number of candidate species credit species have been excluded from further consideration in the BCAR, including green and golden bell frog, brush-tailed phascogale, common planigale, gang-gang cockatoo, giant dragonfly, green-thighed frog, large-eared pied bat, long-nosed potoroo, Mahony's toadlet, brush-tailed rock wallaby, giant burrowing frog, *Astrotricha crassifolia, Maundia triglochinoides, Melaleuca biconvexa, Melaleuca groveana, Persicaria elatior, Prostanthera askania* and *Tetratheca glandulosa.* The BCAR states that these species have been excluded based on "geographical distribution, last known local record being decades old, lack of suitable geological features, isolation of particular habitats or degradation of habitats."

Section 5.2.2 and 5.2.3 of the BAM 2020 outlines the criteria that can be used to exclude a species credit species. This criteria includes that none of the habitat constraints listed in the TBDC for the species are present, that the species is a vagrant in the IBRA subregion, or that after carrying out a field assessment the assessor determines that microhabitats required by a species are absent from the subject land or degraded to the point that the species is unlikely to use the subject land. This final criteria requires that justification is provided with reference to evidence such as published literature. The BCAR should be amended to clearly state the criteria that can be used to exclude a species credit species in accordance with the BAM and should provide further justification why species have been excluded with reference to either the habitat constraints in the TBDC or published literature.

Recommendation 11

The BCAR should be amended to clearly state the criteria that can be used to exclude a species credit species in accordance with the BAM and should provide further justification why species have been excluded with reference to either the habitat constraints in the TBDC or published literature.

12. A species polygon is required for masked owl

The masked owl has been confirmed to be present on the site. Section 5.2.5 outlines that a species polygon must be prepared if a survey confirms that the species is present, however the BCAR does not include a species polygon for masked owl.

Recommendation 12

The BCAR should be amended to include a species polygon for the masked owl, which should be prepared in accordance with the buffer requirements outlined in the TBDC.

13. *Diuris praecox* species polygon should be amended

Diuris praecox has been assumed to be present on the site, as surveys have not been undertaken during the appropriate time in accordance with the TBDC. The species polygon excludes Zones 3 and 4 however, with the BCAR stating that "Zone 3 is too flat and low in the landscape. The grassland vegetation (Zone 4) is also too highly disturbed to support this species." This exclusion is not in accordance with Section 5.2 of the BAM.

In relation to exclusion from Zone 3, this PCT is listed as a vegetation community associated with the species, so this zone should be included within the species polygon.

In relation to Zone 4, section 5.2.3 of the BAM outlines that after carrying out a field assessment the assessor may consider a species unlikely to occur if they determine that microhabitats required by a species are absent from the subject land or degraded to the point that the species is unlikely to use the subject land. This criteria requires that justification is provided with reference to evidence such as published literature, which has not been provided within the BCAR. BCD notes that *Diuris praecox* is known to occur in areas of disturbance.

Recommendation 13

The species polygon for *Diuris praecox* should be amended to include zone 3 and zone 4 (or further justification with reference to published literature and evidence of onsite condition provided within the BCAR).

14. The Serious and Irreversible Impact assessment for swift parrot requires further information

Appendix 2 of the BCAR addresses the Serious and Irreversible Impact assessment criteria outlined in Section 9.1.2 of the BAM, however this assessment requires more information, including supporting references for the impacts on the swift parrot.

For some of the assessment criteria, the BCAR states that it is difficult to assess as it is unknown if there is any swamp mahogany that occurs within the area to be impacted. This information should be collected (mapping showing the location of feed trees) and presented within the BCAR, along with information on any other important feed trees to be impacted (e.g. spotted gum, forest red gum, blackbutt, red bloodwood).

Section 3.2 of the BAM Operational Manual Stage 2 specifies additional documentation required for a SAII assessment and is outlined below:

- clear documentation of the sources of information used such as scientific literature, published and unpublished technical reports, databases, documented field observations or expert opinion (referred to as a 'pers. comm.' with the date of communication, qualifications, advice provided and contact details of the expert) – the assessment should include references to any scientific literature or expert opinion used.
- geo-referenced maps illustrating the derivation of data to address assessment criteria relating to the extent, fragmentation or isolation of the TEC or species population within the development site and more broadly – this should include maps showing swift parrot habitat within the region more broadly, an assessment of cumulative impacts in the region and maps showing all swift parrot feed trees on the site (relevant feed trees are listed within the TBDC and include swamp mahogany, red bloodwood, forest red gum, blackbutt and a number of other eucalypt species).
- an indication of the confidence in the information provided (e.g. low confidence if information is inferred from other similar taxa or communities), or if it is of questionable reliability (e.g. from an unknown source, historical data).
- documentation of any additional conservation measures (i.e. above the credit requirement generated by the BAM-C) proposed and how these will contribute to the recovery of the entity.
- where information is not available, for example where impact thresholds for the entity have not been provided.
- references to sections of the BDAR or BCAR where the information has been documented and therefore does not need to be repeated.

Recommendation 14

BCD recommends the Serious and Irreversible Impact assessment for the swift parrot includes the information and documentation outlined within Section 9.1.2 of the BAM and Section 3.2 of the BAM Operational Manual Stage 2.

15. Offsets for indirect impacts should be considered

Consideration should be given within the BCAR to the impact of edge effects on the corridor areas and whether the indirect impacts on these areas of vegetation will result in a reduction in vegetation integrity and should be offset. Section 2.4.1 of the BAM Operational Manual Stage 2 outlines suggested methods to use biodiversity credits to offset indirect impacts.

Recommendation 15

The BCAR should provide information on the likely edge effects on the retained vegetation and any associated reduction in the vegetation integrity score of this vegetation and consideration should be given to proposing additional biodiversity credits to offset these indirect impacts.

16. Assessment of prescribed impacts is required

Section 5.5.1 of the BCAR assesses prescribed impacts associated with the project, but excludes the prescribed impacts of "habitat connectivity" and “vehicle strikes”. There is an identified regional corridor within the site that has the potential to be impacted by the development and potential increases in traffic associated with the development (particularly along Chain Valley Bay Road adjacent to the EEC vegetation) may result in an increased risk of vehicle strikes to threatened species. This section of the report should address these impacts associated with the development and should include all information outlined within Sections 6, 7.2, 8.3, 8.4 and 8.6 of the BAM and Section 2.5 of the BAM Operational Manual Stage 2, including demonstration of measures taken to avoid and minimise these prescribed impacts.

Recommendation 16

The BCAR should include assessment of the prescribed impacts of habitat connectivity and vehicle strike, including demonstration of measures taken to avoid and minimise these impacts in accordance with Sections 6, 7.2, 8.3, 8.4 and 8.6 of the BAM and Section 2.5 of the BAM Operational Manual Stage 2.

17. Potential hydrological impacts require further assessment

The prescribed impact of “water bodies, water quality and hydrological processes” requires further assessment within Section 5.3 of the BCAR, particularly in relation to stormwater management and the water quality treatment plan and potential impacts on the adjacent EEC. The assessment should include all information outlined in Sections 6, 7.2 and 8.3 of the BAM and Section 2.5 of the BAM Operational Manual Stage 2 and should include details of hydrological assessments undertaken, with reference to potential ecological impacts.

Recommendation 17

The BCAR should be amended to include a more detailed assessment of potential hydrological and water quality impacts, particularly in relation to stormwater management and the water quality treatment plan and potential impacts on the adjacent EEC.

18. Hollow data has been excluded from Quadrat 2

A hollow-bearing tree within Quadrat 2 is shown on Figure 2.3 in the BCAR, however the plot data sheet shows no hollows for this quadrat. The data sheet and entry into the BAM calculator should be amended to include hollows within Quadrat 2.

Recommendation 18

The data sheet and entry into the BAM calculator should be amended to include hollows within Quadrat 2.

19. The proposed biocertification area should be clearly shown on a map

The application form states that the area to be certified is 8.68 hectares, however a map that clearly shows the area proposed to be certified has not been included within the BCAR.

The proposed certification area should include all areas to be impacted by the proposal, including associated infrastructure such as stormwater management and asset protection zones.

Recommendation 19

A map that clearly shows the area proposed to be certified should be included in the BCAR.

20. A Conservation Measures Implementation Plan is required

A Conservation Measures Implementation Plan should be prepared and included with the BCAR. The plan should include the proposed E2 avoided area and how this area is proposed to be managed in the future (including monitoring, reporting and auditing measures), as well as the following requirements outlined in section 12 of the application form in relation to offsetting obligations:

- mechanism for delivery of conservation measures
- responsibility for delivery, including details of biodiversity certification agreements entered or proposed to be entered into
- timing of implementation of conservation measures
- funding sources for delivery of conservation measures
- framework for monitoring, reporting or auditing of the implementation of proposed conservation measures

Recommendation 20

A Conservation Measures Implementation Plan should be included as an attachment to the BCAR, in accordance with Section 12 of the application form and should include proposed management arrangements for the avoided E2 land, as well as details on how the offset obligation will be met.

21. Additional maps and figures are required

There are additional maps and figures that should be included in the BCAR:

- Map of patch size locations for each native vegetation zone and table of patch size areas (as described in Section 4.3.2 of the BAM)

- Map of alternative footprints considered to avoid or minimise impacts on biodiversity values
- Maps demonstrating indirect impact zones
- Shape files including:
    - Subject land boundary
    - Assessment area boundary
    - Cadastral boundary
    - Proposed biocertification area, including asset protection zones
    - Landscape features
    - Vegetation community mapping
    - Floristic veg survey
    - Veg integrity plot locations
    - Species records
    - Species credit species polygons
    - Survey effort
    - Direct and indirect impact zones

Recommendation 21

BCD requests additional maps, figures and shapefiles are provided.

Response to BCD comments

A12

Our ref: 18CP02BCA
Your ref: DOC21/190387-3

4 August 2021

Steven Crick
A/Senior Team Leader Planning
Hunter Central Coast Branch
Biodiversity and Conservation Division
Department of Planning, Industry and Environment
Level 4/26, Honeysuckle Drive
Newcastle NSW 2309

Attention: Mr S Crick

Dear Steven

Re: Response to BCD comments on the Biodiversity Certification Assessment Report for 45 Mulloway Road, Chain Valley Bay

On behalf of Vivacity Property

Travers bushfire & ecology prepared a Biodiversity Certification Assessment Report (BCAR) in association with a planning proposal and Gateway Determination for a manufactured home estate at 45 Mulloway Road, Chain Valley Bay (Lot 5 DP 1228880).

This BCAR along with supporting documents, was submitted to the BCD on 10th March 2021, and a response including multiple recommendations was provided by the BCD on 21st May 2021 (BCD ref. DOC21/190387-3). The attached Table 1 identifies these recommendations and provides responses to each. The BCAR and associated case in the BAM calculator has been amended where appropriate to address these recommendations. Where an update is not warranted, we have provided reasoning in Table 1.

If you require any further information please do not hesitate to the contact the undersigned on 1300 896 998 or at servicedesk@traversecology.com.au

Yours faithfully

Michael Sheather-Reid
Managing Director - ***Travers bushfire & ecology***

Travers bushfire & ecology **employs Bushfire Planning and Design (BPAD) Accredited Practitioners**

Travers bushfire & ecology **employs Accredited BioBanking and Biodiversity Assessors**

BCD comment	*Travers bushfire & ecology* response
1. The BCAR should state whether BAM 2017 or BAM 2020 is proposed to be used The Biodiversity Certification Assessment Report (BCAR) does not outline whether Biodiversity Assessment Method (BAM) 2017 or BAM 2020 is being used for the assessment. The consultant has subsequently indicated that BAM 2020 is proposed to be utilised, however this should be outlined within the BCAR. **Recommendation 1** The BCAR should outline whether BAM 2017 or BAM 2020 is proposed to be used.	The BAM 2020 has been used for this BCAR. This is already stated in section 1.1 - Purpose, and has been reiterated in Section 1.1.1 - certification of BAM compliance.
2. The E2 corridor should be amended to align with the E2 zones on the adjoining properties The Gateway Determination for the planning proposal states that the proposal should be updated to "confirm the width of the proposed E2 Environmental Conservation zone to align with the position of environmental zones on adjoining land, which together must form an appropriate biodiversity corridor for the area". Further, council's assessment of the planning proposal states that the corridor in the south of the site provides interregional landscape connectivity. Extension of the E2 boundary to align with the adjoining properties will ensure there is a greater buffer to the EEC community and the threatened species habitat and will assist to mitigate the impacts of edge effects on threatened species such as the swift parrot, masked owl,	This recommendation was addressed in our response to the previous BCD review of the Biodiversity Constraints Report (provided in Appendix 10 of the previous BCAR), and we reiterate it here. The E2 boundary has been designed to include existing connective values provided by the remnant vegetation in the south of the site. These connective values will be fully retained under the proposed biodiversity certification. The area directly to the north of the proposed E2 boundary will mostly contain the APZ zones or be used for water quality management (detention basin). These areas provide a buffer to the corridor. Although they will remain largely non-vegetated, they serve a role in preserving the existing corridor and will achieve similar ecological outcomes under the proposed RE2 zoning. The extension of the conservation zone would imply that these areas, which are currently cleared and used for rural purposes, have some conservation value, which is not the case. Full revegetation would have a significant impact on the proposal through larger APZs. The fringing cleared edge provide fringing

BCD comment	*Travers bushfire & ecology* response
squirrel glider, eastern pygmy possum and southern myotis as well as minimise prescribed impacts on this area such as hydrological impacts. **Recommendation 2** The E2 corridor should be amended to align with the E2 zones on the adjoining properties in accordance with the Gateway Determination for the planning proposal.	foraging habitat suitable for the foraging behaviour of Masked Owls. As discussed above in the previous response to, the complete revegetation of the fringing edge would alter or remove this foraging utility. The APZ area will be partially planted with additional Swamp Mahogany trees to augment Swift Parrot foraging habitat The widening of the E2 zone and corridor will have a negligible effect on connective values. Figure 1 shows the east–west corridor that includes the southern part of the subject land. The width of the corridor at the subject land is approximately 800 m, whereas the narrowest point to the west is less than 90 m. Extension of the proposed E2 zone to align with the adjoining properties would increase the corridor width to around 900 m at the location of the subject land, but would have no effect on the minimum connective width of the corridor.
3. Further assessment of edge effects on the swamp sclerophyll forest EEC is required The proposal is likely to result in edge effects on the swamp sclerophyll forest on coastal floodplains Endangered Ecological Community (EEC) and associated threatened species habitat. Edge effects include those associated with noisy miner competition, stormwater detention basins, road works, potential hydrological changes from stormwater discharge, introduction of weeds and feral animals, impacts from domestic pets, human disturbance, dumping of materials and increased spill-over from noise, activity, scent and lighting. This area of vegetation contains very high biodiversity values, including it being mapped as an EEC, it being squirrel glider habitat and it containing important winter foraging resources for a number of species, including the swift parrot. Competition from noisy miners and predation by cats are key threats to the swift parrot. It is important that edge effects on this habitat are minimised.	The proposal has been amended to provide for a buffer to the EEC and Swamp Mahogany trees that avoids indirect impacts. A minimum 20 m buffer from the EEC is to be installed. This buffer is to be landscaped in compliance with APZ IPA standards and include planting of additional Swamp Mahogany trees to augment Swift Parrot foraging habitat. More detailed assessment of edge effects is included in Section 5.3.3 of the BCAR, and mitigation measures are addressed in Section 6.2. The VMP included with the CMIP provides management actions to address edge effects on the EEC and Swamp Mahogany trees. This includes fencing to exclude access.

BCD comment	*Travers bushfire & ecology* response
There are also a number of large swamp mahogany trees that are proposed to be cleared. A key management action specified in the Threatened Biodiversity Data Collection (TBDC) the swift parrot is to retain stands of winter-flowering feed-trees. These trees represent important winter foraging habitat and should be contained within an additional buffer to the EEC vegetation. **Recommendation 3** BCD recommends the proposal is amended to address the potential for edge effects on the swamp sclerophyll forest EEC and an additional buffer is created around the large swamp mahogany trees that are currently proposed to be cleared.	
4. Further measures for mitigation of indirect impacts are required The development is likely to result in indirect impacts on the EEC community and threatened species within this area, including swift parrot, masked owl, squirrel glider, eastern pygmy possum and southern myotis. This includes impacts associated with noisy miner competition, stormwater detention basins, road works, potential hydrological changes from stormwater discharge, introduction of weeds and feral animals, impacts from domestic pets, human disturbance, dumping of materials and increased spill-over from noise, activity, scent and lighting. Section 6.2 of the BCAR lists a number of mitigation measures, however it does not address all of these potential impacts. Mitigation measures should be proposed to minimise all of the potential indirect impacts associated with the development. For example, development control measures should be proposed to manage impacts such as increased domestic cat and dog presence and predation. **Recommendation 4**	Further details on mitigation are provided in Section 6.2 of the BCAR, and in the updated VMP and CMIP. The VMP shows: 1. Buffer to EEC and Swift Parrot habitat. 2. VMP measures - Measures to alleviate impacts from domestic cats owned by residents, including condition on residents restricting cat ownership - Fencing to minimise lighting and sound effects on Masked Owl nest tree

BCD comment	*Travers bushfire & ecology* response
Further mitigation measures should be proposed to minimise all the potential indirect impacts associated with the development.	
5. Further justification for the selection of PCTs is required Section 3.1.3 of the BCAR outlines the evidence used to identify a Plant Community Type (PCT), however this section excludes consideration of PCT1619 for zones 1 & 2 and excludes consideration of PCT1721 for zone 3. These PCTs have been allocated to similar vegetation communities on a site nearby on Mulloway Road. If PCT allocations are amended, the list of candidate threatened species should be reviewed based on the new PCTs. **Recommendation 5** Further justification should be provided for the selection of each PCT in the BCAR, including consideration of PCT1619 and PCT1721.	The BCAR has been updated to include re-assessment and further justification for PCT selection. Based on this, the original PCTs 1636 and 1718 remain and are considered the most accurate PCTs for the subject land (see Section 3.1.3 of the BCAR).
6. There is inconsistency in PCT information in the BCAR There is inconsistency between the information within Table 3.2, which states that PCT 1636 and PCT 1824 were shortlisted as PCTs for Zones 1 and 2 and the text below, which states that PCT 1619 and PCT 1824 were shortlisted as PCTs for Zones 1 and 2. **Recommendation 6** The BCAR should be amended to correct the inconsistencies in the method described for allocating PCTs within Section 3.1.3.	Inconsistencies have been corrected in section 3.1.3.

BCD comment	*Travers bushfire & ecology* response
7. All native vegetation should be included in PCT mapping A narrow strip of native vegetation along the entry road on the western side of the property has been excluded from the PCT mapping. This native vegetation should be included in the PCT mapping and in the calculations of vegetation to be cleared and species credit species polygons. Species credit calculations should then be amended and the BAM calculator re-run. **Recommendation 7** The native vegetation adjacent to the access road on the western site of the property should be included in PCT mapping and species polygons and clearance calculations should be amended in the BCAR.	Mapping changes have been undertaken to include vegetation adjacent to the access road within Zone 1, as recommended. Subsequent adjustment of Zone area has been made in the BCAR and BAM-C case.
8. Zone boundaries require review A small patch of vegetation in the south-western corner of the site has been allocated to Zone 2, Scribbly Gum – Red Bloodwood community (PCT 1636), however this vegetation consists of swamp mahogany trees and should be included within Zone 3 (PCT 1718 - Swamp Mahogany – Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast). **Recommendation 8** The PCT allocation for the vegetation in the south-western corner of the site should be changed from PCT 1636 to PCT 1718 due to the presence of swamp mahogany trees.	Mapping changes have been undertaken to include vegetation in the SW corned as PCT 1718. This vegetation will no longer be impacted by the amended proposal, and as such does not require allocation to a Vegetation Zone.
9. Targeted flora surveys may not be sufficient The BCAR does not specify the width that parallel belt transects were undertaken for targeted threatened flora surveys. It appears from Figure	Due to re-design of the concept masterplan, PCT 1718, which was previously allocated to Zone 3, will no longer be impacted by the proposal and as such does not require allocation to a Vegetation Zone. Subsequently, threatened flora searches are not necessary within this vegetation for credit calculation

BCD comment	*Travers bushfire & ecology* response
2.3 that a width of approximately 20 metres has been used for the swamp sclerophyll forest (PCT 1718, Zone 3) and up to 50 metres for Zone 4, which is not sufficient to detect many of the species targeted. Section 4.2 of Surveying threatened plants and their habitats: NSW survey guide for the Biodiversity Assessment Method (2020) outlines the required widths for parallel field traverses, which is five metres for orchids, grasses, aquatic plants, epiphytes, ferns, herbs and forbs in dense vegetation and 10 metres in open vegetation. **Recommendation 9** BCD recommends the BCAR specify the width of parallel belt transects undertaken for targeted flora surveys and that they are in accordance with the BAM requirements outlined in Surveying threatened plans and their habitats: NSW survey guide for the Biodiversity Assessment Method (2020) or further surveys are undertaken to meet the BAM requirements.	purposes. Width of belt transects are now provided in Section 2.2. It is acknowledged that the width of belt transects within the grassland (current Zone 3, previously allocated to Zone 4) is not sufficient for orchids, herbs and forbs. However, additional justification is provided in Section 4.2.2 (e) of the BCAR in accordance with the TBDC to demonstrate that vegetation within Zone 3 is too degraded to support the BAM-C predicted orchids and forbs. As such, the width of belt transects within Zone 3 is of no consequence as the species in question can be excluded as candidate species due to degradation of habitat.
10. Ecosystem credit species that have been excluded erroneously should be included A number of ecosystem credit species generated by the BAM-C have been excluded from the candidate species list, including black bittern, black-chinned honeyeater, gang-gang cockatoo, golden-tipped bat, grey-crowned babbler, painted honeyeater, speckled warbler and yellowbellied glider. The BCAR states that this is because of the absence of recent records within 10 kilometres and that they were not recorded in surveys. This is not a relevant criteria within the BAM to remove a species from the candidate list. Section 5.2 of the BAM outlines the criteria to be used to confirm candidate species. Species can be excluded if habitat constraints listed in the TBDC are not present or the species is a vagrant in the IBRA subregion. This does not apply to any of these species that have been excluded except the painted honeyeater.	The BCAR has been amended to include the ecosystem credit species as recommended.

BCD comment	*Travers bushfire & ecology* response
Recommendation 10 BCD recommends that the BCAR is amended to include the following ecosystem credit species as candidate species: black bittern, black-chinned honeyeater, gang-gang cockatoo, golden-tipped bat, grey-crowned babbler, speckled warbler and yellow-bellied glider.	
11. Incorrect criteria have been used to exclude species credit species A number of candidate species credit species have been excluded from further consideration in the BCAR, including green and golden bell frog, brush-tailed phascogale, common planigale, gang-gang cockatoo, giant dragonfly, green-thighed frog, large-eared pied bat, long-nosed potoroo, Mahony's toadlet, brush-tailed rock wallaby, giant burrowing frog, Astrotricha crassifolia, Maundia triglochinoides, Melaleuca biconvexa, Melaleuca groveana, Persicaria elatior, Prostanthera askania and Tetratheca glandulosa. The BCAR states that these species have been excluded based on "geographical distribution, last known local record being decades old, lack of suitable geological features, isolation of particular habitats or degradation of habitats." Section 5.2.2 and 5.2.3 of the BAM 2020 outlines the criteria that can be used to exclude a species credit species. This criteria includes that none of the habitat constraints listed in the TBDC for the species are present, that the species is a vagrant in the IBRA subregion, or that after carrying out a field assessment the assessor determines that microhabitats required by a species are absent from the subject land or degraded to the point that the species is unlikely to use the subject land. This final criteria requires that justification is provided with reference to evidence such as published literature. The BCAR should be amended to clearly state the criteria that can be used to exclude a species credit species in accordance with the BAM and should provide further justification why	Additional assessment has been provided in BCAR to provide justification for removal of credit species. This has been provided with reference to acceptable criteria such as absence of habitat constraints as outlined within the TBDC, sufficient survey based on guidelines, justified vagrancy or otherwise absence of micro habitat features with reference to published literature. Some species have been included as candidate species if sufficient justification is not able to be provided. As PCT 1718 will no longer be impacted by the proposal, the BAM-C no longer includes certain candidate species for consideration. These include *Maundia triglochinoides, Melaleuca biconvexa, Persicaria elatior* and *Petalura gigantea* which are not associated with PCT 1636 and as such do not need consideration as candidate species. As stated above under point 9, additional justification is provided in Section 4.2.2 (e) of the BCAR in accordance with the TBDC to demonstrate that vegetation within Zone 3 is too degraded to support the BAM-C predicted orchids and forbs. As such, the species in question can be excluded as candidate species due to degradation of habitat.

BCD comment	*Travers bushfire & ecology* response
species have been excluded with reference to either the habitat constraints in the TBDC or published literature. **Recommendation 11** The BCAR should be amended to clearly state the criteria that can be used to exclude a species credit species in accordance with the BAM and should provide further justification why species have been excluded with reference to either the habitat constraints in the TBDC or published literature.	
12. A species polygon is required for masked owl The masked owl has been confirmed to be present on the site. Section 5.2.5 outlines that a species polygon must be prepared if a survey confirms that the species is present, however the BCAR does not include a species polygon for masked owl. **Recommendation 12** The BCAR should be amended to include a species polygon for the masked owl, which should be prepared in accordance with the buffer requirements outlined in the TBDC.	A species polygon has been prepared for Masked Owl calculated from a 100 m buffer off the nest tree, which subsequently extends into a small 0.037 ha edge of the PCT 1636_grassland vegetation zone. This is included in the credit calculations. This habitat will be altered only by placement of a stormwater detention basin. This area will therefore not be subject to disturbance activity and construction of the dam will be undertaken outside of the recognised breeding period. The foraging edge of Swamp Forest will not be altered and a protection buffer along this edge has been provided for foraging.
13. Diuris praecox species polygon should be amended Diuris praecox has been assumed to be present on the site, as surveys have not been undertaken during the appropriate time in accordance with the TBDC. The species polygon excludes Zones 3 and 4 however, with the BCAR stating that “Zone 3 is too flat and low in the landscape. The grassland vegetation (Zone 4) is also too highly disturbed to support this species.” This exclusion is not in accordance with Section 5.2 of the BAM.	Due to re-design of the concept masterplan, PCT 1718, which was previously allocated to Zone 3, will no longer be impacted by the proposal and as such does not require allocation to a Vegetation Zone. Subsequently, assessment for *D. praecox* is not required for credit calculation purposes. Further justification is provided in Section 4.2.2 (e) of the BCAR in accordance with the TBDC to demonstrate that vegetation within Zone 3 is too degraded to support this species. As such, the width of belt transects within Zone 3 is of no consequence as *D. praecox* can be excluded as

BCD comment	*Travers bushfire & ecology* response
In relation to exclusion from Zone 3, this PCT is listed as a vegetation community associated with the species, so this zone should be included within the species polygon. In relation to Zone 4, section 5.2.3 of the BAM outlines that after carrying out a field assessment the assessor may consider a species unlikely to occur if they determine that microhabitats required by a species are absent from the subject land or degraded to the point that the species is unlikely to use the subject land. This criteria requires that justification is provided with reference to evidence such as published literature, which has not been provided within the BCAR. BCD notes that Diuris praecox is known to occur in areas of disturbance. **Recommendation 13** The species polygon for Diuris praecox should be amended to include zone 3 and zone 4 (or further justification with reference to published literature and evidence of onsite condition provided within the BCAR).	candidate species due to degradation of habitat.
14. The Serious and Irreversible Impact assessment for swift parrot requires further information Appendix 2 of the BCAR addresses the Serious and Irreversible Impact assessment criteria outlined in Section 9.1.2 of the BAM, however this assessment requires more information, including supporting references for the impacts on the swift parrot. For some of the assessment criteria, the BCAR states that it is difficult to assess as it is unknown if there is any swamp mahogany that occurs within the area to be impacted. This information should be collected (mapping showing the location of feed trees) and presented within the BCAR, along with information on any other important feed trees to be impacted (e.g. spotted gum, forest red gum, blackbutt, red bloodwood).	Additional detail has been provided in the SAII assessment for Swift Parrot to ensure a more thorough assessment for the species. This detail has included supporting references on impacts and habitat considerations. These have included further sourced relevant literature as outlined in the TBDC and a summary of local records on both *BioNet* and *eBird* online databases. It has also included a further consideration on other potential foraging trees species such as Red Bloodwood which is listed as important in the species profile but not previously considered as part of the proposal. The conservation buffer to the EEC vegetation and Swift Parrot habitat will avoid impacts on the mapped important habitat and all Swamp Mahogany trees, which is a demonstrable avoidance action. Additional conservation and mitigation measures to address potential impacts as well as added mitigation measures have been imposed as a result of the assessment.

BCD comment	***Travers bushfire & ecology* response**
Section 3.2 of the BAM Operational Manual Stage 2 specifies additional documentation required for a SAII assessment and is outlined below: • clear documentation of the sources of information used such as scientific literature, published and unpublished technical reports, databases, documented field observations or expert opinion (referred to as a 'pers. comm.' with the date of communication, qualifications, advice provided and contact details of the expert) – the assessment should include references to any scientific literature or expert opinion used. • geo-referenced maps illustrating the derivation of data to address assessment criteria relating to the extent, fragmentation or isolation of the TEC or species population within the development site and more broadly – this should include maps showing swift parrot habitat within the region more broadly, an assessment of cumulative impacts in the region and maps showing all swift parrot feed trees on the site (relevant feed trees are listed within the TBDC and include swamp mahogany, red bloodwood, forest red gum, blackbutt and a number of other eucalypt species). • an indication of the confidence in the information provided (e.g. low confidence if information is inferred from other similar taxa or communities), or if it is of questionable reliability (e.g. from an unknown source, historical data). • Documentation of any additional conservation measures (i.e. above the credit requirement generated by the BAM-C) proposed and how these will contribute to the recovery of the entity. • Where information is not available, for example where impact thresholds for the entity have not been provided. • references to	We feel the summary of information now presented will permit an effective determination on potential SAII by the Minister. The VMP and CMIP will also detail additional conservation measures to mitigate any indirect impacts on Swift Parrot habitat, including planting of supplementary Swamp Mahogany trees for foraging habitat.

BCD comment	*Travers bushfire & ecology* response
sections of the BDAR or BCAR where the information has been documented and therefore does not need to be repeated. **Recommendation 14** BCD recommends the Serious and Irreversible Impact assessment for the swift parrot includes the information and documentation outlined within Section 9.1.2 of the BAM and Section 3.2 of the BAM Operational Manual Stage 2.	
15. Offsets for indirect impacts should be considered Consideration should be given within the BCAR to the impact of edge effects on the corridor areas and whether the indirect impacts on these areas of vegetation will result in a reduction in vegetation integrity and should be offset. Section 2.4.1 of the BAM Operational Manual Stage 2 outlines suggested methods to use biodiversity credits to offset indirect impacts. **Recommendation 15** The BCAR should provide information on the likely edge effects on the retained vegetation and any associated reduction in the vegetation integrity score of this vegetation and consideration should be given to proposing additional biodiversity credits to offset these indirect impacts.	Consideration of offsetting indirect impacts is provided in section 5.3.3 of the BCAR. We consider that offsetting for indirect impacts is not necessary as the proposal will not create any additional edge effects on the EEC vegetation, and the mitigation measures included in the VMP and CMIP will ensure ongoing management to avoid indirect impacts.
16. Assessment of prescribed impacts is required Section 5.5.1 of the BCAR assesses prescribed impacts associated with the project, but excludes the prescribed impacts of "habitat connectivity" and “vehicle strikes”. There is an identified regional corridor within the site that has the potential to be impacted by the development and potential increases in traffic associated with the development (particularly along Chain Valley Bay Road adjacent to the EEC	The BCAR has been updated to include an additional assessment on prescribed impacts of "habitat connectivity" and “vehicle strikes”. This assessment recognizes the contribution of the site to local connectivity values and also the potential for increased traffic flows along Chain Valley Bat Road. The recorded Masked Owl has been considered as well as other threatened fauna with most potential to occur and be impacted, such as the Wallum Froglet and Squirrel Glider.

BCD comment	*Travers bushfire & ecology* response
vegetation) may result in an increased risk of vehicle strikes to threatened species. This section of the report should address these impacts associated with the development and should include all information outlined within Sections 6, 7.2, 8.3, 8.4 and 8.6 of the BAM and Section 2.5 of the BAM Operational Manual Stage 2, including demonstration of measures taken to avoid and minimise these prescribed impacts. **Recommendation 16** The BCAR should include assessment of the prescribed impacts of habitat connectivity and vehicle strike, including demonstration of measures taken to avoid and minimise these impacts in accordance with Sections 6, 7.2, 8.3, 8.4 and 8.6 of the BAM and Section 2.5 of the BAM Operational Manual Stage 2.	Measures to reduce indirect impact have been outlined. The outcome of both additional assessment considerations has however not warranted any further mitigation measures than those previously outlined as part of other considerations.
17. Potential hydrological impacts require further assessment The prescribed impact of "water bodies, water quality and hydrological processes" requires further assessment within Section 5.3 of the BCAR, particularly in relation to stormwater management and the water quality treatment plan and potential impacts on the adjacent EEC. The assessment should include all information outlined in Sections 6, 7.2 and 8.3 of the BAM and Section 2.5 of the BAM Operational Manual Stage 2 and should include details of hydrological assessments undertaken, with reference to potential ecological impacts. **Recommendation 17** The BCAR should be amended to include a more detailed assessment of potential hydrological and water quality impacts, particularly in relation to stormwater management and the water quality treatment plan and potential impacts on the adjacent EEC.	BCAR has been updated to include additional assessment of hydrological impacts. This is provided in Section 5.3.1 of the BCAR.

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18. Hollow data has been excluded from Quadrat 2 A hollow-bearing tree within Quadrat 2 is shown on Figure 2.3 in the BCAR, however the plot data sheet shows no hollows for this quadrat. The data sheet and entry into the BAM calculator should be amended to include hollows within Quadrat 2. **Recommendation 18** The data sheet and entry into the BAM calculator should be amended to include hollows within Quadrat 2.	Data sheet and entry into the BAM calculator has been amended to include hollows within Quadrat 2.
19. The proposed biocertification area should be clearly shown on a map The application form states that the area to be certified is 8.68 hectares, however a map that clearly shows the area proposed to be certified has not been included within the BCAR. The proposed certification area should include all areas to be impacted by the proposal, including associated infrastructure such as stormwater management and asset protection zones. **Recommendation 19** A map that clearly shows the area proposed to be certified should be included in the BCAR.	Additional mapping to be undertaken to clearly show biocertification area. See also point 21.
20. A Conservation Measures Implementation Plan is required A Conservation Measures Implementation Plan should be prepared and included with the BCAR. The plan should include the proposed E2 avoided area and how this area is proposed to be managed in the future (including monitoring, reporting and auditing measures), as well as the following requirements outlined in section 12 of the application form in	A draft CMIP had already been prepared, but was not submitted following advice from the BCD. This advice was obviously erroneous, and we have now included an updated CMIP as part of the submission.

BCD comment	*Travers bushfire & ecology* response
relation to offsetting obligations: • mechanism for delivery of conservation measures • responsibility for delivery, including details of biodiversity certification agreements entered or proposed to be entered into • timing of implementation of conservation measures • funding sources for delivery of conservation measures • framework for monitoring, reporting or auditing of the implementation of proposed conservation measures **Recommendation 20** A Conservation Measures Implementation Plan should be included as an attachment to the BCAR, in accordance with Section 12 of the application form and should include proposed management arrangements for the avoided E2 land, as well as details on how the offset obligation will be met.	
21. Additional maps and figures are required There are additional maps and figures that should be included in the BCAR: • Map of patch size locations for each native vegetation zone and table of patch size areas (as described in Section 4.3.2 of the BAM) • Map of alternative footprints considered to avoid or minimise impacts	Additional mapping is provided. See comment 19.

BCD comment	*Travers bushfire & ecology* response
on biodiversity values • Maps demonstrating indirect impact zones • Shape files including: o Subject land boundary o Assessment area boundary o Cadastral boundary asdfas - Proposed biocertification area, including asset protection zones - Landscape features - Vegetation community mapping - Floristic veg survey - Veg integrity plot locations - Species records - Species credit species polygons o Survey effort - Direct and indirect impact zones **Recommendation 21** BCD requests additional maps, figures and shapefiles are provided.	