


Tuggerah Gateway Proposal Biodiversity Certification Assessment Report

Scentre Group



DOCUMENT CONTROL

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Template 2.8.1

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Abbreviations


Table 1: Abbreviations

Abbreviation	Description
BAM	Biodiversity Assessment Method
BAMC	Biodiversity Assessment Method Credit Calculator
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
BCAR	Biodiversity Certification Assessment Report
BDAR	Biodiversity Development Assessment Report
BSSAR	Biodiversity Stewardship Site Assessment Report
CEEC	Critically Endangered Ecological Community
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DNG	Derived Native Grassland
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
ELA	Eco Logical Australia Pty Ltd
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FM Act	NSW <i>Fisheries Management Act 1994</i>
GIS	Geographic Information System
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
LGA	Local Government Area
NSW	New South Wales
NOW	NSW Office of Water
PCT	Plant Community Type
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TEC	Threatened Ecological Community
VIS	Vegetation Information System
VMP	Vegetation Management Plan
WM Act	NSW <i>Water Management Act 2000</i>

Declarations

i. Certification under clause 6.15 *Biodiversity Conservation Act 2016*

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

Signature:  _____

Date: 10/11/2023 _____

BAM Assessor Accreditation no: BAAS17101 _____

This BCAR has been prepared to meet the requirements of the Biodiversity Assessment Method (BAM) 2020.

This BCAR has been prepared on the basis of the requirements of, and information provided under the BAM as at 10/11/2023 and that date is within 14 days of the date the report is submitted to the department (as part of formal application for standard or strategic certification).

The BAM Calculator (BAM-C) has been finalised and submitted within the Biodiversity Offsets and Agreement Management System (BOAMS). The BCAR has been submitted to the department within 14 days of the finalisation of the BAM-C.

ii. Details and experience of author/s and contributors

Details of the person/s responsible for preparing the BCAR and surveys on which the BCAR relies is presented below.

Table 2: Authors and Contributors

Name	BAM Assessor Accreditation no. (if relevant)	Position/role	Tasks performed	Relevant qualifications
Lily Gorrell	BAAS17101	Senior Ecologist Operations Manager – Hunter Region	Report preparation. BAM-C data entry and analysis. Document review.	Bachelor of Natural Resource Management (Hons). University of New England. Accredited Assessor (BAM; BBAM).
Janene Devereux	BAAS19045	Senior Ecologist	Report preparation. BAM plot surveys. Targeted threatened fauna surveys.	Bachelor of Science Majoring in Marine Science and Sustainable Resources Management. University of Newcastle. Accredited Assessor (BAM).

Name	BAM Assessor Accreditation no. (if relevant)	Position/role	Tasks performed	Relevant qualifications
Liam Scanlan	BAAS23026	Experienced Ecologist	Targeted threatened fauna surveys. Targeted threatened flora surveys.	Bachelor of Science (Honours), Botany. University of the Sunshine Coast. Bachelor of Science (B.Sc.), Environmental Studies / Plant Science. University of Tasmania. Accredited Assessor (BAM).
Shawn Ryan	-	Ecologist (no longer with ELA)	Targeted threatened fauna surveys. Targeted threatened flora surveys. BAM plot surveys.	Bachelor of Environmental Science and Management – Ecology. University of Newcastle.
Daniel Watts	BAAS19038	Senior Ecologist (no longer with ELA)	Report preparation. Targeted threatened fauna surveys. Targeted threatened flora surveys.	Bachelor of Science (Biology) (Hons). Sydney University.

iii. Conflict of interest

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

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Signature:  _____

Date: 10/11/2023 _____

BAM Assessor Accreditation no: BAAS17101 _____

Executive Summary

Eco Logical Australia Pty Ltd (ELA) were engaged by Scentre Group Pty Ltd to prepare this Biodiversity Certification Assessment Report for the rezoning and future development of a parcel of land proposed for biodiversity certification (the Biocertification area) at the Tuggerah Gateway Site located at 60 Wyong Road, Tuggerah (Lot 3/DP1084221 and Lot 2/DP1056960). The Tuggerah Gateway Site is located directly adjacent and to the west of the existing Tuggerah Westfield Shopping Centre.

The Tuggerah Gateway Site predominantly consisted of exotic/modified grasslands, however, field survey identified scattered remnant and regrowth vegetation including five native plant community types comprising of:

- PCT 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion
- PCT 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast
- PCT 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
- PCT 1720 - Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast
- PCT 1105 - River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion

Two of these communities align with Threatened Ecological Communities (TEC) being: PCT 1718 which aligns with the final determination for *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* listed as Endangered under the NSW *Biodiversity Conservation Act 2016* (BC Act); and PCT 1720 which aligns with the final determination for the BC Act Endangered Ecological Community *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*.

One threatened flora species was recorded during surveys being *Melaleuca biconvexa* (Biconvex Paperbark) listed as Vulnerable under both the BC Act and the EPBC Act. This species is a species credit species and therefore requires offsets. No individuals will be impacted, due to detailed avoid and minimise being applied post consultation, however, a small portion of associated habitat will be impacted due to the construction of a road access from Wyong Road into the site.

Four threatened Microchiropteran bats were recorded across the Biodiversity Certification Assessment Area during surveys including:

- *Miniopterus australis* (Little Bent-winged Bat)
- *Miniopterus orianae oceanensis* (Large Bent-winged Bat)
- *Myotis macropus* (Southern Myotis)
- *Scoteanax rueppellii* (Yellow-bellied sheath-tail bat)

Of these fauna species, only one requires offset to be calculated for impacts to habitat, being Southern Myotis. Species polygons are applied to habitat on the subject land within 200m of suitable waterbodies

with pools/ stretches 3m or wider. All other species are considered ecosystem species for the habitats present within or nearby to the Biocertification area.

This BCAR has provided an indicative credit requirement for impacts associated with the clearing of native vegetation within the Biocertification area. A total of 17 Ecosystem credit are required for PCTs 689, 1589, 1718 and 1105. A total of 1 credit is required for *Melaleuca biconvexa* (Biconvex Paperbark) associated habitat and 24 species credits are required for Southern Myotis (*Myotis macropus*) impacted habitat.

Due to the relatively minimal suite of credits required, the Proponent is proposing to obtain the credits required by purchasing credits off the market or paying into the Biodiversity Conservation Fund.

The Proponent also proposes the creation of an 88 Instrument across the 'land subject to conservation measures', with the implementation of a 5-year Vegetation Management Plan (VMP) to manage biodiversity values present within these portions of the BCAA.

Stage 1: Biodiversity Assessment

1. Introduction

1.1. Proposed Development

1.1.1. Certification overview

This Biodiversity Certification Assessment Report (BCAR) has been prepared by Lily Gorrell, an Accredited Person (#BAAS17101) to apply the Biodiversity Assessment Method (BAM) under the NSW *Biodiversity Conservation Act 2016* (BC Act). All credit calculations have been undertaken using the BAM Calculator (BAMC) version in parent case number 00025311.

This assessment has been completed in accordance with the BAM, version 2020.

Definitions of terminology used throughout this report are presented in Appendix A.

1.1.2. General description of the project area

This BCAR assesses the impacts of the proposed rezoning and future development of a parcel of land proposed for Biocertification, hereby referred to as the 'Biocertification area', at Tuggerah (Tuggerah Gateway Site). The Biocertification area is located within a wider Biodiversity Certification Assessment Area (BCAA) (Figure 1, Figure 2 and Figure 3), part of which will be retained and managed for its conservation values and has been assessed as 'land subject to conservation measures'.

A planning proposal has also been submitted to Central Coast Council for the rezoning of the BCAA. The BCAA incorporates the following lots:

- Lot 3/DP1084221
- Lot 2/DP1056960

The proposed BCAA is bordered by the Pacific Highway and Wyong Road to the west and north, with commercial districts (Tuggerah Westfield Shopping Centre) and residential communities to the east.

The surveys completed for this BCAR were undertaken as part of the assessment for the wider BCAA. The BCAA is dominated by cleared pasture, with scattered patches of trees and is currently used for grazing. The remnant patches of moderate condition vegetation in the south and moderate/low condition vegetation in the north-west of the BCAA comprise the areas of 'land subject to conservation measures'.

Vegetation within the BCAA predominantly consisted of exotic/modified grasslands. Vegetation across the south-east of the site consisted of Spotted Gum open forest of low to moderate condition. Sections of White Mahogany shrubby tall open forest are situated on the eastern boundary of the site. Small, isolated patches of Cabbage Gum forest, River Oak open forests, and exotic vegetation are situated within the centre of the BCAA.

The BCAA is divided evenly by two different NSW (Mitchell) landscapes (see Figure 2). The north-western extent of the site is Sydney - Newcastle Coastal Alluvial Plains, comprising of undulating plains and low rises on Quaternary sand or Permian/Triassic sandstone or shale with swampy valley floors. It

is typified by siliceous uniform sands, patches of deep podsol and yellow or brown texture-contrast soils on bedrock (DECC 2002).

The south-eastern extent of the BCAA is Gosford - Cooranbong Coastal Slopes, consisting of rolling hills and sandstone plateau outliers of Triassic Narrabeen sandstones, extensive rock outcrop and low cliffs along ridge margins. Texture-contrast soils on lithic sandstones and shales. Loamy sand alluvium along creeks. This landscape is defined by organic sand and mud in lagoons and swamps (DECC 2002).

This report includes two base maps, the Site Map (Figure 1) and the Location Map (Figure 2). The area proposed for Biocertification is shown in Figure 3.

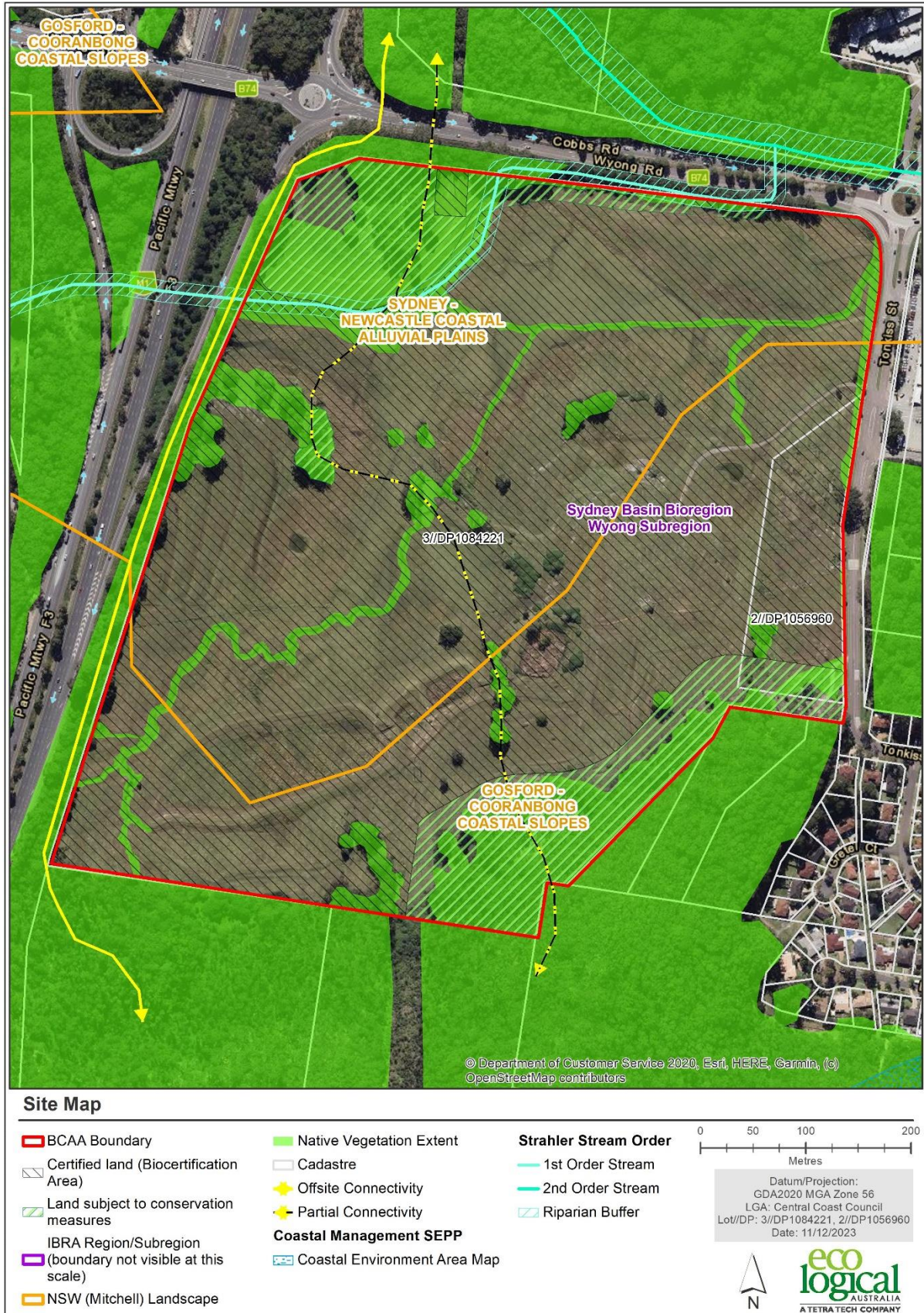


Figure 1: Site Map.



Figure 2: Location Map.

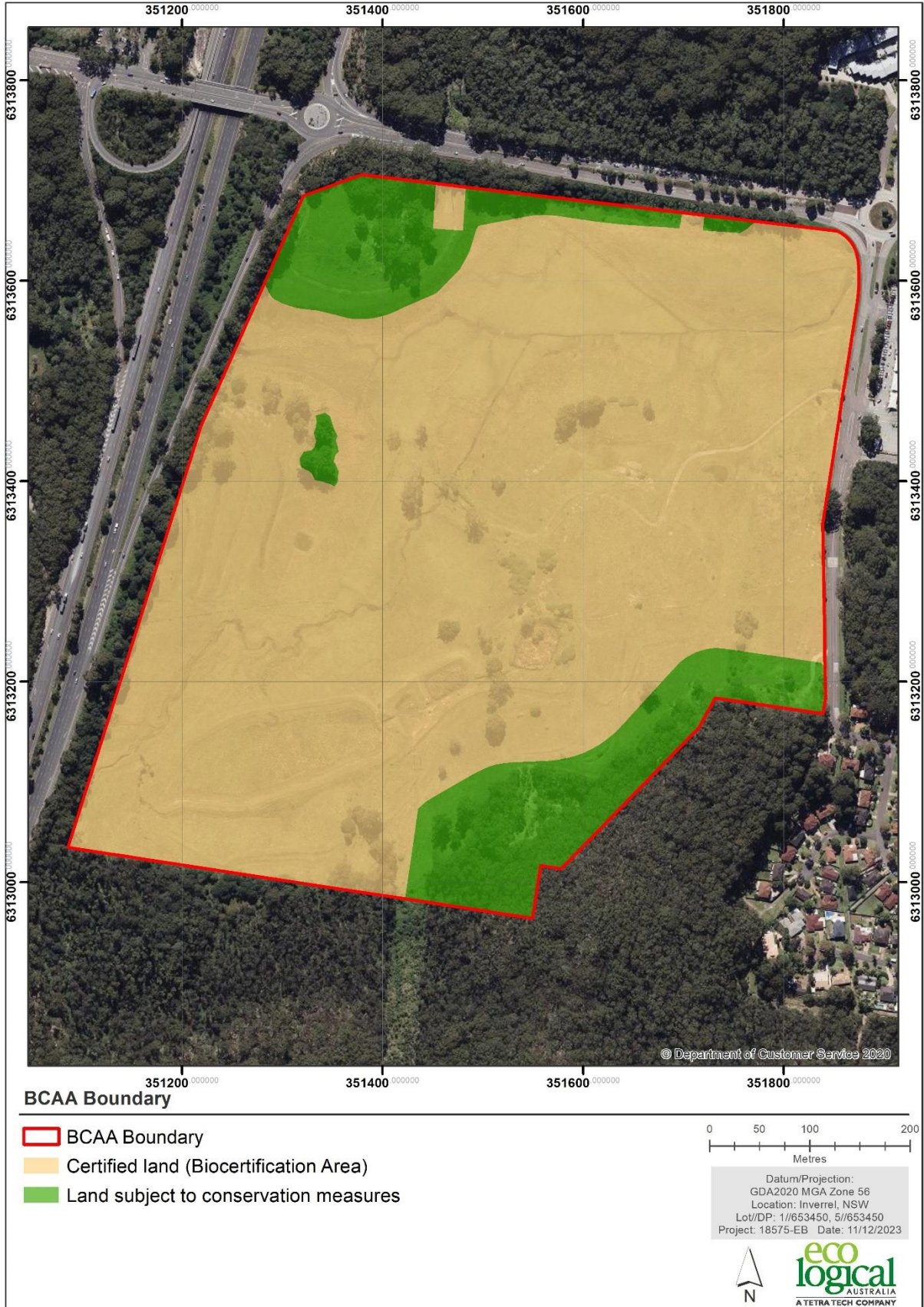


Figure 3: BCAA boundary, Proposed Certified land and Land subject to proposed conservation measures

1.1.3. Biocertification Certification Assessment Area

The current zoning of the BCAA is comprised of land zoned RU6 Transition, B4 mixed use and a small portion of C2 Environmental conservation under the Wyong Local Environmental Plan (LEP) 2013 (Figure 4). This Biocertification application will accompany a planning proposal to rezone land within the BCAA for future residential, recreational and environmental land uses. Proposed zoning changes for the BCAA are confined primarily to the RU6 Transition zone, where it is proposed to be rezoned to R1 General Residential and retain the B4 mixed use.

Land currently zoned as RU6: Transition, comprising the remnant vegetation within the rocky outcrops of the northern portion of the BCAA is proposed to be rezoned to C2: Environmental Conservation as part of the DA. Areas of existing C2: Environmental Conservation in the southern portion of the BCAA, as per the requirements of that zoning, have been retained with additional areas proposed to augment this C2 zoning (Figure 5). These areas will be managed as part of 'land proposed for conservation measures'.

An outline of the BCAA and concept plan footprint, and the proposed concept plan for the BCAA is presented in Figure 5 and Figure 6.

1.1.4. Other documentation and consistency with relevant documents/reports/drawing sets

This BCAR has been prepared with consideration of numerous discussions held with Central Coast Council and Department of Planning and Environment (DPE) (BCD Division) on biodiversity and flooding matters post Gateway Determination.

The submitted documents achieves the following outcomes and confirms:

- that the spatial planning of Mardi Creek and the north/south WSUD drainage corridor has reasonably avoided the impacts to high biodiversity values,
- that the design of the Gateway site is capable of avoiding adverse impact on the *Melaleuca Bioconvexa* on the northern boundary of the site. This has been confirmed through detailed civil, landscape and flooding reviews,
- that the riparian corridor meets Council's minimum design requirements and objectives for proper riparian corridor management,
- that the riparian corridor and WSUD corridor provide an amenity outcome that balances flood and ecological management including re-creating wildlife corridors with consideration given to strategy 6.1-6.5 of the Central Coast Regional Plan 2041, as well as supporting open space and recreation values, and
- that the flood study, civil/stormwater drawings, BCAR/ecological report, landscape concepts are all in alignment.

Given the importance of the raised matters and to enable greater certainty in the development outcome, detailed design testing and documentation has been prepared which should provide added comfort and certainty to Council and BCD. We have tested the design to a level that would ordinarily be expected in a Development Application submission.

The site planning and design incorporates the following key shifts since the original Planning Proposal submission (and that referenced in the BCD letter dated 23 June):

- Removal of one large stormwater basin and the incorporation of three smaller basins in the WSUD corridor, which in turn results in terraced gabion walls that have an overall reduction in wall height.

- Slight reshaping of the riparian corridor southward (adjacent to the north western corner of the MU1 zoned land) to create a substantial setback to the *Melaleuca Biconvexa* along Wyong Road as well as incorporating space for additional replenishment planting.
- Movement of the flood storage arrangement to enable a future larger area of usable public open space that is sited out of high flood hazard areas.
- An enlargement of the central open space (to the west and south) on the R1 zoned land, which after testing an indicative landscape concept, confirms that it would align with Council's park design requirements.
- Ensure there is alignment in all technical documentation - for example the roughness of the corridors to align with the landscaping layout / cross-sections as well as the stormwater infrastructure/civil design. The flood modelling has been undertaken against a detailed, technical riparian and waterway corridor documentation (which has been designed to be as naturalised in amenity) to ensure the outcome is robust.

This BCAR is consistent with the descriptions, boundaries and recommendations detailed within the following reports submitted by the Proponent:

- Flood report, prepared by Stantec.
- Civil/stormwater drawing set, prepared by IDC.
- Indicative landscape concept sketches and cross sections within the Urban Design Report, prepared by Urbis.

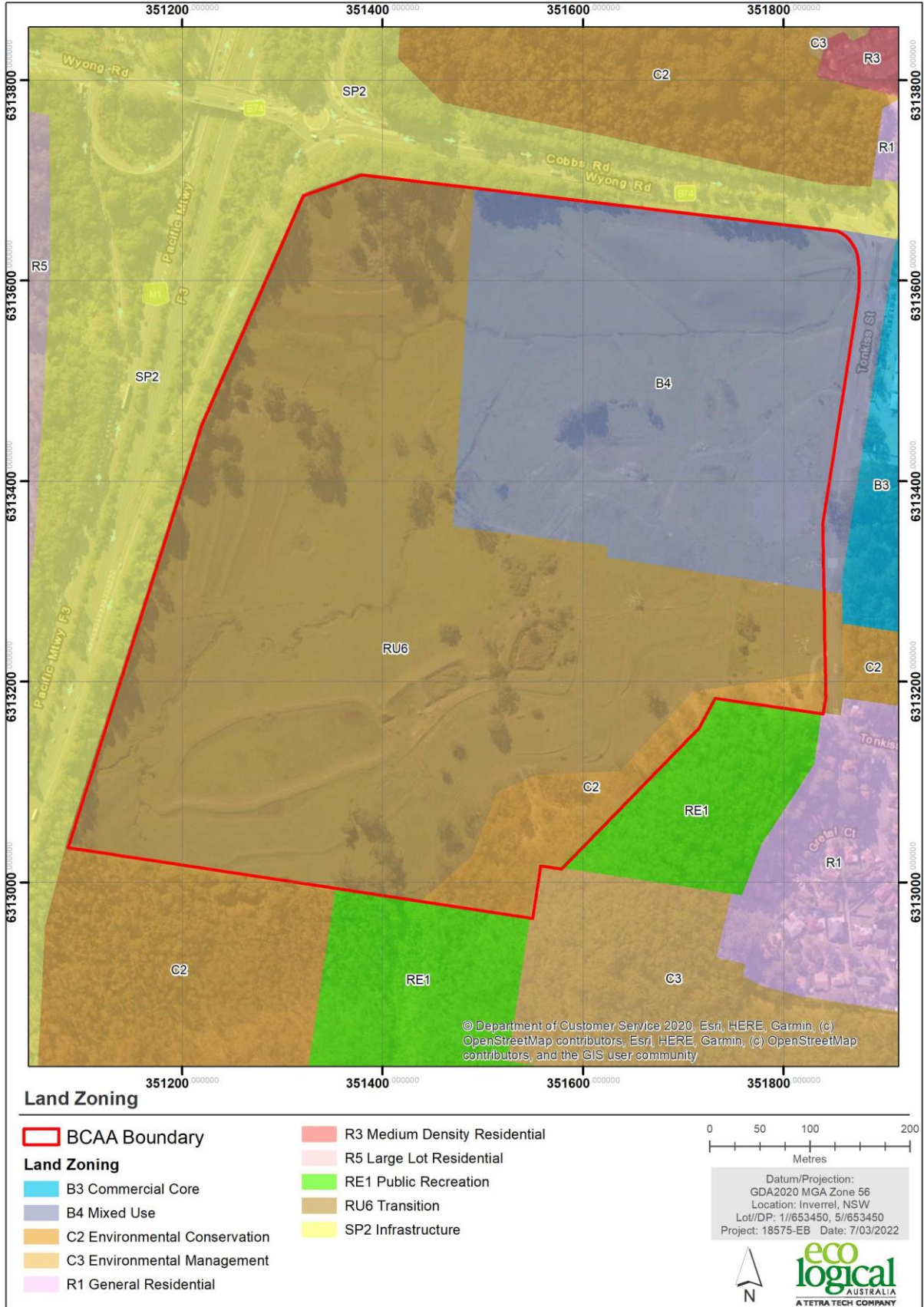


Figure 4: BCAA and current Land Zoning



Figure 5: BCAA and Concept Plan



LEGEND

- Area A - Gateway Site
- Conservation Zones/Riparian Corridors/
Ecological Endangered Communities (EEC)
- Open Spaces
- Mardi Creek
- Developable Area
- Key Open Space
- Indicative Access

Figure 6 Draft DCP for the Project Site (Provided by URBIS – 08 Nov 2023)

1.2. Legislative Context

Table 3: Legislative context

Legislation	Relevance to the project	Report Section
Commonwealth		
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Matters of National Environmental Significance (MNES) have been identified on or near the BCAA. Whilst a Planning Proposal is not considered an 'action' under the EPBC Act, this report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES.	Section 10.1 and Appendix E and F
State		
<i>Environmental Planning and Assessment Act 1979</i>	This planning proposal is to be submitted for Gateway Determination under division 3.4, s 3.34 of the EP&A Act.	Entire report
<i>Biodiversity Conservation Act 2016</i>	Biodiversity certification of the BCAA has been proposed in accordance with Part 8 of the BC Act. This report has been prepared to satisfy requirements of the BC Act and BAM relating to biodiversity certification.	Entire report
<i>Fisheries Management Act 1994 (FM Act)</i>	The BCAA does not contain areas mapped as Key Fish Habitat under the FM Act. The subsequent development will not involve impacts to Key Fish Habitat, will not involve harm to marine vegetation, dredging, reclamation or obstruction of fish passage. A permit or consultation under the FM Act is unlikely to be required at the DA stage.	N/A
<i>Water Management Act 2000 (WM Act)</i>	The project involves work on waterfront lands. A controlled activity approval will likely be required when development consent is sought.	N/A
Planning Instruments		
<i>State Environmental Planning Policy (SEPP) Resilience and Hazards 2021</i>	The BCAA does not contain any land mapped as Coastal Wetland, Coastal Wetlands Proximity Area and Coastal Environment Area on the Resilience and Hazards SEPP. No further consideration required.	N/A
<i>SEPP (Biodiversity and Conservation 2021)</i>	This SEPP provides an assessment process that is applicable at the Development Application stage. It is therefore not applicable to a Planning Proposal under Part 3 of the EP&A Act. If the site is Biocertified, the SEPP will not apply to the Biocertified land as per the <i>Biodiversity Conservation Act 2016</i> . However, information on koala habitat is provided in this report.	Section 10.2
<i>Wyong Local Environment Plan 2013</i>	The Biocertification area contains the following land zonings under the Wyong LEP 2013: <ul style="list-style-type: none"> • B4 – Mixed Use • C2 – Environmental Conservation • R1 – General Residential • RU6 – Transition 	Section 1

1.3. Matters of national environmental significance

the proposed development is not deemed a controlled action and does not require referral under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). See Section 10.1 for further details on MNES.

1.4. Information Sources

The following information sources were reviewed as part of this report:

- Aerial mapping (SIXMaps and Nearmap)
- Biodiversity Assessment Method Calculator
- BioNet Vegetation Classification
- Biodiversity Values Map and Threshold Tool
- BioNet Threatened Biodiversity Data Collection (TBDC)
- BioNet / Atlas of NSW Wildlife 10 km database search (NSW Department of Planning, Industry and Environment (DPIE) accessed 13 May 2021)
- EPBC Act Protected Matters Search Tool 10 km database search (Department of Agriculture, Water and the Environment (DAWE), accessed 6 April 2021)
- Geographic information system (GIS) datasets including soil, topography, geology and drainage
- NSW Survey Guide for Threatened Frogs A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method (DPIE 2020a)
- ‘Species credit’ threatened bats and their habitats NSW survey guide for the Biodiversity Assessment Method (OEH 2018)
- Central Coast Council Flora and Fauna Guidelines (2019) (CCC 2019)
- Surveying threatened plants and their habitats – NSW survey guide for the Biodiversity Assessment Method (DPIE 2020b)
- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft (Department of Environment and Conservation (DEC) 2004).
- NSW Department of Planning and Environment, 2022, Central Coast Regional Plan 2041.

1.5. Consultation

The Proponent has undertaken detailed consultation with both Hunter Central Coast Branch Biodiversity and Conservation Division (BCD) and Central Coast Council on a number of matters. A summary of the matters raised, and an outline of the measures taken to address these, where possible is presented below.

1. *Review the proposed avoidance strategy for the subject land, with particular reference to local strategies promoting the retention of biodiversity corridors.*

Response:

Detailed revision of the proposed design has occurred in consultation with BCD, Council, Flooding and Civil design team and ELA. A significant reduction, and ‘avoidance’ of impacts to *Melaleuca biconvexa* individuals and habitat has occurred along the northern boundary. This has led to a reduction in habitat impacted for *M. biconvexa*, Southern Myotis (*Myotis macropus*) and Swamp Sclerophyll Forest EEC. The detail of avoidance is presented in Table 4 below.

Waterways across the site currently form grassed depressions comprising of a high proportion of exotic species. Whilst a number of these waterways have been mapped as TECs (due to a proportion of suitable groundlayer species presence) and have been mapped as species polygons for Southern Myotis, they are also mapped as low condition areas and comprise minimal biodiversity values to 'avoid or minimise' i.e. no presence of a midstorey or canopy and no regeneration occurring. Based on this, the BAM hierarchy of 'avoid and minimise' within these areas is less pertinent, however the third component of this hierarchy is 'mitigate'. This third principle of mitigate will be utilised with the Proponent proposing to re-create/realign a functioning waterway along the 1st order stream of Mardi Creek. A cross section of the proposed landscape plan is shown in Figure 7. They also propose to add in a 'Natural Low Land Corridor / Open Space Corridor' from Mardi Creek to the south of the site. This will comprise an existing natural low topographical feature that forms a slow and meandering natural overflow corridor incorporating stormwater basins and shared pedestrian/cycleway. This area will include plantings of locally indigenous species of canopy, mid-layer and ground-layer species. Additional detail on scope proposed is presented in the 'Indicative landscape concept sketches and cross sections' within the Urban Design Report, prepared by Urbis. The exact specifications will be determined at the landscaping phase.

Table 4: Additional avoid and minimise post consultation

Species/TEC	Common Name	BC listing status	Act	EPBC Act Listing status	Pre consultation habitat impacted (ha)	Post consultation habitat impacted (ha)	Avoid and minimise (ha)
Melaleuca biconvexa	Biconvex paperbark	Vulnerable		Vulnerable	0.14	0.02	0.12
Myotis macropus	Southern myotis	Vulnerable		-	2.20	2.00	0.20
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.		Endangered		-	Mod Condition: 0.14	0.02	0.12

2. *BCD specifically mentioned moving the substation out of any areas of biodiversity values.*

Response:

The Proponent has considered a number of alternative options for the placement of the substation, however, there are a number of physical constraints which make shifting the location difficult, these are discussed as follows:

- Changes in alignment of major overhead power lines can place additional loads on the stanchions and it is always preferred by electricity authorities to have as straight alignments as possible.
- The location of the water course immediately to the east of the proposed stanchion location means that moving it to the east is not feasible.
- The gradients of the site to the west of the proposed location, coinciding with significant vegetation also mean that any shifting of the stanchion to the west is also not preferred.
- Placement of this substation on Council owned land, across the road is not a suitable alternative, as this would be impacting intact, good condition vegetation.

- The location has been minimised, and represents the optimal solution given the various physical constraints.

3. *BCD raised comment on the waterways present on the site forming part of 'avoid and minimise'.*

Response:

Addressed in conjunction with point 1 above. currently existing waterways on site, that form grassed depressions which mainly comprise exotic species will be re-created/realign to form functioning waterways and Natural Low Land Corridor / Open Space Corridors. Further detail on these proposed spaces is available in the updated Urban Design Report, prepared by Urbis (2023).

4. *Consideration on the biodiversity assessment pathway, why BCAR still best pathway not BDAR.*

Response:

The main reason for choosing the BCAR pathway is due to the proposed staging of works. The Proponent wishes to have all biodiversity matters addressed upfront, to allow for future staged works to occur without the need for individual BDARs at each DA.

5. *The Biodiversity Certification Application (BCA) should be formally submitted for review to ensure that the BCA and planning proposal assessment processes align.*

Response:

The most up to date BCAR (this version) and BCA will be formally submitted for review to the BCD.

6. *The scoping proposal should utilise the data obtained in the biodiversity assessments to consider how the proposed structure plan could become consistent with strategy 6.1-6.5 of the Central Coast Regional Plan 2041.*

Response:

Strategy 6.1 – 6.5 of the Central Coast Regional Plan 2041 has been reviewed, it is considered that the proposed development is in line with these strategies based on the considerable effort to re-design the existing degraded waterways and the creation of Natural Low Land Corridor / Open Space Corridors that will connect the vegetation in the northern C2 zones with intact vegetation occurring outside the Development Footprint.

7. *Additional Comment (as of meeting date 06/12/2023)*

Soft buffer to minimise impacts and protect biodiversity along the increased C2 zone in the southern portion of the Biocertification area.

The C2 zone in the south has been increased by 53%, from 2ha (existing C2) to 3.7ha (proposed new C2) as part of the Biocertification. The original C2 zone did not encompass all areas of PCT 1589 (moderate condition) or PCT 1589 (low condition). The increase in proposed C2 Zone was considered based on protecting all of the higher biodiversity values, i.e. particularly PCT 1589 (mod), whilst allowing for a significant increase to this area, which extends out into primarily mapped 'Exotic' grasslands. This increased area also includes a 10 m soft buffer occurring on the outer edge of the proposed new C2 zone (Figure 5). The biodiversity values of this area will be managed as per the proposed VMP.

SECTION 1

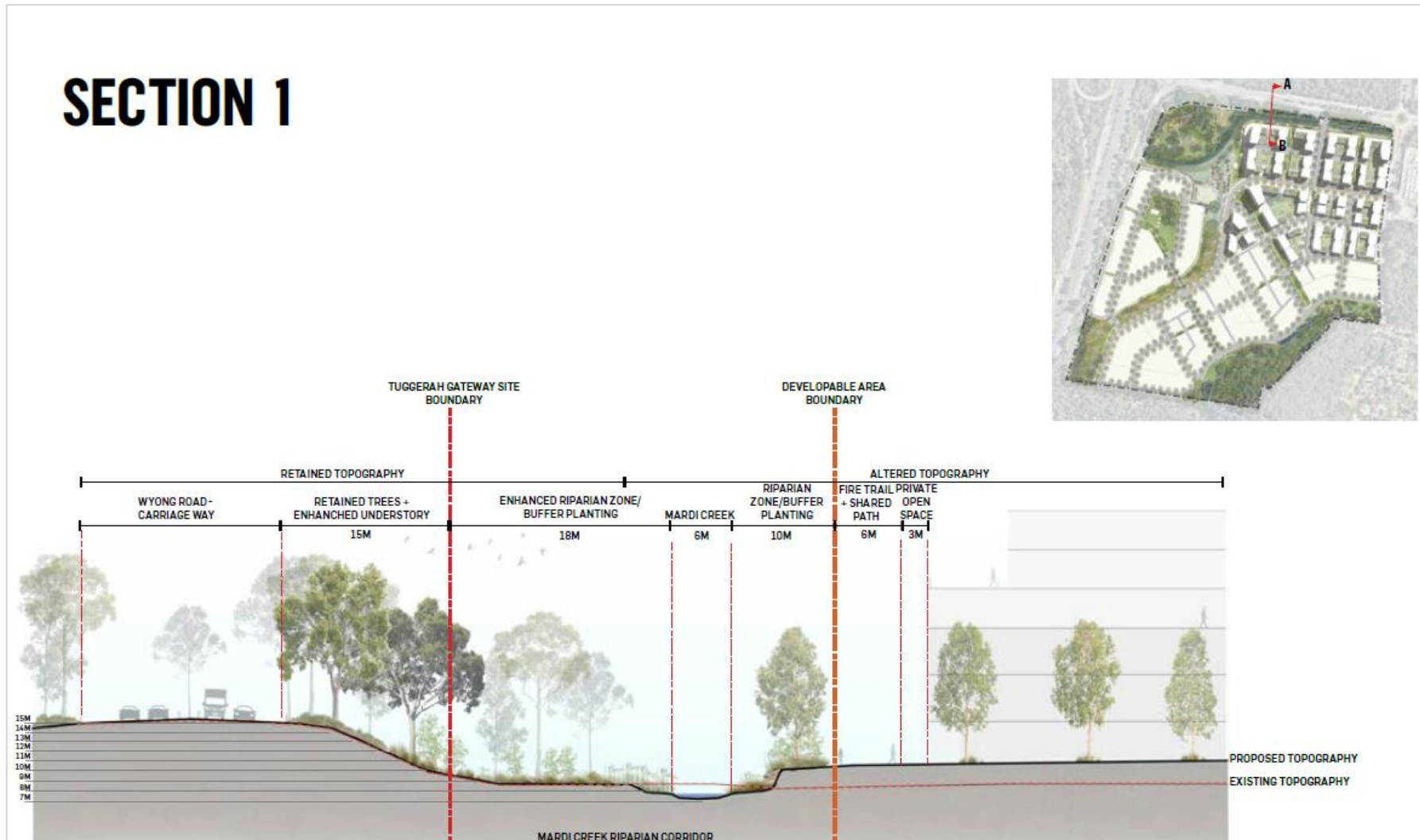


Figure 7: Proposed landscape cross sections – Mardi Creek

2. Site Context Methods

2.1. Landscape features and site context

Identification and descriptions of site context components and landscape features are outlined in Table 5. Landscape features are shown on Figure 1 and Figure 2.

Table 5: Landscape features

Landscape feature	Description	Data Source
IBRA Region(s)	Sydney Basin	Interim Biogeographic Regionalisation for Australia, Version 7.
IBRA Subregion(s)	Wyong	Interim Biogeographic Regionalisation for Australia, Version 7.
Rivers and streams	The following watercourses are present in the Biocertification area. <ul style="list-style-type: none"> • Mardi Creek – 1st order – 10 m Riparian Buffer. 	NSW LPI Waterway mapping.
Estuaries and wetlands	No wetlands occur in the Biocertification area or in proximity to the Biocertification area.	NSW directory of important wetlands.
Connectivity of different areas of habitat	The Biocertification area contains several connectivity features consisting of native vegetation and habitat. Fringing vegetation along the western edge of the BCAA and the scattered paddock trees through the centre of the BCAA provide partial connection to the intact forest to the south (see Figure 2). In addition to this vegetation connectivity, Mardi Creek flows into the site from the west, underneath the M1, allowing for potential connectivity for some aerial species such as microbats.	Aerial imagery.
Geological features of significance and soil hazard features	The Biocertification area contains areas mapped as Class 5 and Class 4 Acid Sulfate Soils. Considered of Low probability of occurrence.	Aerial imagery. Site Assessment.
Areas of Outstanding Biodiversity Value	No areas of outstanding biodiversity value have been declared within the Biocertification area.	Register of Declared Areas of Outstanding Biodiversity Value (DPIE 2021).
NSW (Mitchell) Landscapes	Two Mitchell Landscapes are present in the Biocertification area: <ul style="list-style-type: none"> • Sydney - Newcastle Coastal Alluvial Plains • Gosford - Cooranbong Coastal Slopes 	NSW (Mitchell) Landscapes - version 3.1 (DPIE 2016).
Percent (%) native vegetation extent	The BCAA is approximately 41.6 ha and contains approximately 7.83 ha of native vegetation. The assessment area is 1131.4 ha and comprises 524.7 ha of native vegetation. The native vegetation cover is 46% across the assessment area. There are no differences between the mapped vegetation extent and the aerial imagery.	Calculated using aerial imagery and ArcGIS software.
Patch Size	Patch Size Patch size was calculated using available vegetation mapping for all patches of intact native	Calculated using aerial imagery and ArcGIS software.

Landscape feature	Description	Data Source
	vegetation on and adjoining the BCAR boundary. The patch size is greater than 100 ha (the maximum patch size class within the BAM). Therefore, a patch size of 101 ha has been used for the assessment.	

3. Native Vegetation

3.1. Methods - Survey Effort

3.1.1. Plant Community Type Mapping

Initial vegetation survey was undertaken within the BCAA by ELA ecologists Shawn Ryan and Janene Devereux on the 7 and 8 April 2021.

Vegetation validation Rapid Data Points (RDPs) recorded the dominant canopy, midstorey and groundcover species, structural cover condition, vegetation structure, weed species, threatened species, vegetation condition, landform element and pattern across the BCAA. This initial vegetation validation survey allowed for rapid identification of Plant Community Types (PCTs) and potential habitat for threatened species within the BCAA.

3.1.2. BAM Vegetation Integrity Plots

Following this effort, a total of thirteen (13) full-floristic and vegetation integrity plots were surveyed to further validate and identify the PCTs on site and determine condition, consistent with the BAM, for the purpose of the BCAR. A summary of data collected for the full-floristic and vegetation integrity plots supporting the BCAR includes:

- Site ID.
- Name of recorder(s).
- Date.
- Plot orientation, slope, and aspect.
- Easting and northing at either end of the 50 m transect.
- Site photographs.
- A plot-based 400 m² full floristic survey.
- A plot and transect survey (20 x 50).

Within the 20 m x 20 m quadrat, the following data was collected at each plot-based full floristic survey site:

- Species name.
- Stratum (& layer): in which each species occurs.
- Cover: an estimate of the appropriate cover measure for each recorded species: from 1-5% and then to the nearest 5%.
- Abundance: A relative measure of the number of individuals or shoots of a species within the plot using the following intervals: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 50, 100, 500, 1000, or specify a number greater than 1000 if required.
- Form: (T) Tree; (S) Shrub; (G) Grass and grass like (F) Forb; (E) Fern; (O) other.

Within each 50 m x 20 m plot survey, the following information was collected:

- The number of large trees, tree regeneration, tree stem size class, total length of fallen logs, number of hollow-bearing trees.
- Within five 1m x 1m sub-plots litter cover.

All field data collected at full-floristic vegetation integrity plots is included in Appendix B and Appendix C.

Vegetation survey within the BCAA have been conducted between April 2021 and June 2021 by the personnel listed in Table 6.

Table 6: Full-floristic PCT identification plots

Date	Personnel	Survey type
07/04/2021	Shawn Ryan and Janene Devereux	BAM plots and vegetation validation
08/04/2021	Shawn Ryan and Janene Devereux	BAM plots and vegetation validation
20/04/2021	Shawn Ryan and Janene Devereux	BAM plots and vegetation validation
10/05/2021	Shawn Ryan and Janene Devereux	BAM plots

A summary of floristic and vegetation integrity plots collected across PCTs is included in Table 7. Detailed plot data is provided in Appendix B (all plots) and appendix C (plots within Biocertification area). A map of PCTs and locations of plots within the BCAA is shown in Figure 10.

Table 7: Full-floristic PCT identification plots across the BCAA

PCT ID	PCT Name	No. of plots surveyed in BCAA area
684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	4 (1, 2, 12, 13)
1589	Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast	3 (3,4,5)
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	2 (6,8)
1720	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	1 (7)
1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	1 (10)
n/a	Exotic grassland	2 (9, 11)
Total Plots:		13

3.2. Results: Native Vegetation, Threatened Ecological Communities and Vegetation Integrity

3.2.1. Plant Community Types present

Following field surveys, data collected during vegetation validation was utilised to develop vegetation mapping for the BCAA. Communities were assigned a 'best-fit' PCT using the BioNet Vegetation Classification (OEH 2018) based on landscape features, IBRA region and subregion, soil landscapes (DCLM 1993) and the species composition of vegetation communities mapped.

A total of 5 PCTs were identified in the BCAA (Table 8). Justification for the selection of PCTs occurring in the BCAA is based on a quantitative analysis of full-floristic plot data and is provided in Table 9.

Table 8: Plant Community Types within the BCAA

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Area in BCAA (ha)	% cleared
684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	2.63	42
1589	Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast	Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	2.57	71
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Coastal Swamp Forests	Forested Wetlands	2.10	74
1720	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	Coastal Floodplain Wetlands	Forested Wetlands	0.45	90
1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	Eastern Riverine Forests	Forested Woodlands	0.09	40
n/a	Exotic vegetation (trees/shrubs)	n/a	n/a	0.47	n/a
n/a	Exotic grassland	n/a	n/a	33	
n/a	Dam	n/a	n/a	0.31	n/a

3.2.2. PCT Selection Justification

In determining the PCTs for the BCAA, various attributes were considered in combination to assign vegetation to the best fit PCT. Attributes included dominant species in each stratum, community composition, soils and landscape position. Reference was made to the PCT descriptions in the BioNet Vegetation Classification, the final determination and other published documents describing the vegetation community and / or threatened ecological community.

ELA determined the native vegetation within the BCAA comprises of the following five PCTs (Table 9, Figure 8).

Table 9: PCT Selection Justification

PCT ID	PCT Name	Selection Criteria	Species relied upon for identification of vegetation type and relative abundance
684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Diagnostic species, landscape position, soil, IBRA region and subregion	All occurrences of this PCT consist of a sparse canopy dominated by remnant (50-79cm DBH) diagnostic canopy species; <i>Eucalyptus pilularis</i> , <i>Angophora floribunda</i> and <i>Syncarpia glomulifera</i> . Understorey species are limited, due to past clearing and grazing activities, although mesophyllous species characteristic of Wet Sclerophyll Forest occur within the BCAA and in higher abundance within adjacent intact areas. The above assemblage of key species, formation characteristics in combination with its coastal lowlands landscape position within Wyong IBRA-subregion make PCT 684 the best fit community.
1589	Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast	Diagnostic species, landscape position, soil, IBRA region and subregion	All occurrences of this PCT consist of an open canopy dominated by remnant (50-79cm DBH) diagnostic species; <i>Corymbia maculata</i> and <i>Eucalyptus umbra</i> . The understorey includes sclerophyllous shrubs, graminoids, grasses and climbers typical of Dry Sclerophyll Forest formation within the Hunter Macleay. The above assemblage of key species, formation characteristics in combination with its coastal lowland landscape position on sandstones within Wyong IBRA-subregion make PCT1589 the best fit community.
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Diagnostic species, landscape position, soil, IBRA region and subregion	This community occurs in two forms within the BCAA, including a treeless form within the wetter drainage line areas and a more typical form in relatively drier areas. Upslope occurrences of this PCT consist of a sparse canopy of remnant (50-79cm DBH) diagnostic species; <i>Eucalyptus robusta</i> and <i>Angophora floribunda</i> . Understorey species are limited due to extensive grazing activities, although indicative adjacent areas display the diagnostic myrtaceous midstorey and hydrophytic ground cover typical of Coastal Swamp Forests. The drainage line form lacks any overstorey and is dominated by hydrophytes. Its occurrence is likely part of the natural mosaic of temporary pools and sedge dominated vegetation within this community, in combination with ongoing modification from clearing and grazing activities. The above assemblage of key species, formation characteristics in combination with its coastal lowlands landscape position within Wyong IBRA-subregion make PCT1718 the best fit community.
1720	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	Diagnostic species, landscape position, soil, IBRA region and subregion	All occurrences of this PCT consist of a sparse canopy dominated by remnant (50-79cm DBH) diagnostic canopy species; <i>Eucalyptus amplifolia</i> . Understorey species are limited, due to extensive grazing activities, although adjacent areas are indicative of a myrtaceous midstorey and damp sedge and grass dominated ground layer characteristic of Coastal Floodplain Wetlands. The above assemblage of key species, formation characteristics in combination with its low-lying landscape position within Wyong IBRA-subregion make PCT1720 the best fit community.
1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	Diagnostic species, landscape position, soil, IBRA region and subregion	The occurrence of this PCT within the BCAA consist of an open canopy dominated by diagnostic species; <i>Casuarina cunninghamia</i> . Understorey species are limited due to extensive grazing and clearing activities. There is no indicative nearby occurrences of this community. The occurrence of this community is likely planted and not naturally occurring within the BCAA, however the assemblage of key canopy species and occurrence within Wyong IBRA-subregion make PCT1105 the best fit community.

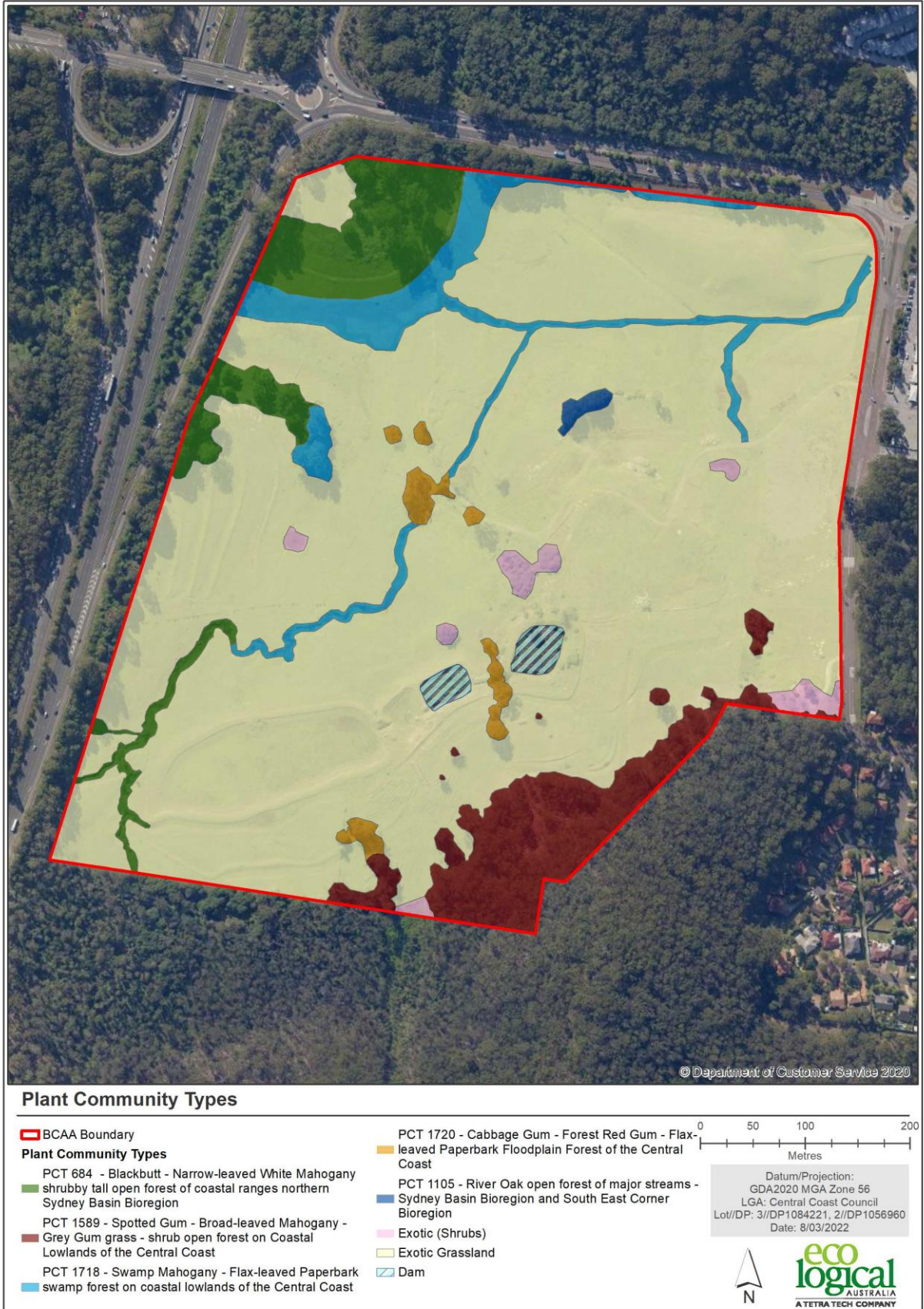


Figure 8: PCT's identified in the BCAA

3.2.3. Threatened Ecological Communities (TEC) identification and justification

All PCTs within the BCAA were assessed for consistency with any TECs listed under the BC Act and EPBC Act. Justification for consistency/inconsistencies of PCTs with TECs is provided in Table 10 and TECs are mapped in Figure 9.

Table 10: TECs within the BCAA

PCT and Condition	BC Act Associated TEC justification	EPBC Act Associated TEC justification	Area (ha) within Biocertification area
1718 Moderate	- The assemblage of key species, formation characteristics in combination with its coastal lowlands landscape position within Wyong IBRA-subregion aligns with the <i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> .	No associated TEC	0.02 ha
1718 Low	- The assemblage of key species, formation characteristics in combination with its coastal lowlands landscape position within Wyong IBRA-subregion aligns with the <i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> .	No associated TEC	1.56 ha
1720 Low	- The assemblage of key species, formation characteristics in combination with its low-lying landscape position within Wyong IBRA-subregion aligns with the EEC <i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> .	This patch does not meet the minimum condition threshold for the EPBC listed <i>River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria</i> . This small patch of PCT 1720 does not meet the Condition classes thresholds for the ecological community under the <i>Conservation Advice for the River Flat Eucalypt Forest</i> (DAWE;2020). A small patch is considered >0.5 ha. The area of PCT 1720 within the Biocertification area is 0.45 ha and vegetation present does not meet the Biotic threshold, falling well below the 'Moderate condition' of >30% perennial understorey vegetation being native species and ground cover richness being >4 native species per plot.	0.45 ha



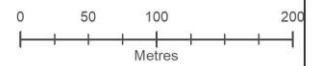
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Threatened Ecological Communities

BCAA Boundary

Threatened Ecological Communities

- Vegetation zone 6: 1718 (Moderate condition) Swamp Sclerophyll Forest EEC (BC Act)
- Vegetation zone 7: 1718 (Low condition) Swamp Sclerophyll Forest EEC (BC Act)
- Vegetation zone 8: 1720 (Low condition) River Flat Eucalypt Forest EEC (BC Act)



Datum/Projection:
GDA2020 MGA Zone 56
LGA: Central Coast Council
Lot//DP: 3//DP1084221, 2//DP1056960
Date: 7/03/2022



Figure 9: TECs within the BCAA

3.2.4. Vegetation Zones

A total of eleven vegetation zones were present in the BCAA, of which nine are located in the Biocertification area. Vegetation zones within PCTs were classified based on condition or historic disturbance. A detailed description of vegetation zones is provided in Table 11. A map of vegetation zones is shown in Figure 10. Full PCT profiles for each PCT is also presented in Appendix D.

Table 11: Vegetation zones within the BCAA and the Biocertification area

Vegetation Zone	PCT	Condition	Area (ha) within BCAA	Area(ha) within Biocertification area (impact)	Description	TEC Status
1	684	High	0.57	0.57	This zone is characterised by remnant canopy species with partly intact shrub and groundcover layer. Although it has suffered disturbance from past clearing, adjacent pastural activities and common exotic species are present, it consists largely of native species and canopy regeneration is present (Photograph 1).	n/a
2	684	Moderate	0.64	0.03	This zone has suffered from higher levels of past clearing and pastural activities and is characterised by a sparse canopy layer with abundant exotic species within the shrub and ground layers. It occurs as isolated patches of canopy species with a ground layer dominated by common pastural grass species (Photograph 2).	n/a
3	684	Low	1.43	0.44	This zone has been highly modified from the original condition and lacks a canopy or mid-layer. The groundlayer comprises <i>Paspalum dilatatum</i> (Paspalum), <i>Axonopus fissifolius</i> (Crabgrass), however still comprises some native groundcovers such as <i>Dianella caerulea</i> var. <i>producta</i> (White flax-Lily), <i>Echinopogon caespitosus</i> var. <i>caespitosus</i> (Hedgehog grass) and <i>Microlaena stipoides</i> var. <i>stipoides</i> (Weeping grass) (Photograph 3).	n/a
4	1589	Moderate	1.65	0	Comprises moderate floristic diversity including remnant canopy species. 5% weeds present including <i>Lantana camara</i> (Lantana) and <i>Bidens pilosa</i> var. <i>pilosa</i> (Farmers Friend). Likely a result of human disturbance due to past clearing and adjacent pastural activities (Photograph 4).	n/a
5	1589	Low	0.92	0.28	This zone is characterised by a remnant canopy with a degraded understorey structure, low floristic diversity and higher presence of exotic ground covers. 10-20% weeds present including <i>Ehrharta erecta</i> (Panic Veldtgrass); <i>Lantana camara</i> (Lantana) and <i>Paspalum dilatatum</i> (Paspalum). Likely a result of human disturbance due to past clearing and adjacent pastural activities (Photograph 5).	n/a
6	1718	Moderate	0.34	0.02	This zone has a sparse remnant canopy with a degraded understorey, low floristic diversity and higher presence of exotic ground covers. 30-50% weeds are present including <i>Axonopus fissifolius</i> (Crabgrass); <i>Lantana camara</i> (Lantana) and	Conforms to the BC Act listed EEC Swamp Sclerophyll Forest

Vegetation Zone	PCT	Condition	Area (ha) within BCAA	Area(ha) within Biocertification area (impact)	Description	TEC Status
					<i>Paspalum dilatatum</i> (Paspalum). Likely a result of human disturbance due to past clearing and current grazing activities (Photograph 6).	
7	1718	Low	1.76	1.56	The zone lacks a canopy layer and occurs within drainage lines with a higher diversity of semi-aquatic groundcover species. 10-20% weeds are present including <i>Isolepis prolifera</i> ; <i>Myriophyllum aquaticum</i> (Brazilian Water-milfoil) and <i>Paspalum urvillei</i> (Vasey Grass). Likely a result of human disturbance due to past clearing and current grazing activities (Photograph 7).	Conforms to the BC Act listed EEC Swamp Sclerophyll Forest
8	1720	Low	0.45	0.45	This zone is characterised by a remnant canopy with a degraded understorey structure, low floristic diversity and higher presence of exotic ground covers. 60-80% weeds present including <i>Axonopus fissifolius</i> (Crabgrass); <i>Lantana camara</i> (Lantana) and <i>Paspalum dilatatum</i> (Paspalum) which is attributed to human disturbance due to clearing and current grazing activities (Photograph 8).	Conforms to the BC Act listed EEC River-Flat Eucalypt Forest. This zone does not meet the condition threshold for the TEC under the EPBC Act.
9	1105	Planted	0.09	0.09	This zone comprises a canopy of <i>Casuarina cunninghamiana</i> subsp. <i>cunninghamiana</i> that appears to have been planted in a row along a slight raised bank. The mid-layer comprises <i>Lantana camara</i> (Lantana) with an exotic groundlayer of <i>Ehrharta erecta</i> (Panic veldtgrass) and <i>Cynodon dactylon</i> (Couch grass) (Photograph 9).	n/a
10	n/a	Exotic vegetation (trees/shrubs)	0.47	0.47	This comprises of large patches of <i>Lantana camara</i> (Lantana), <i>Cinnamomum camphora</i> (Camphor laurel) and <i>Rubus fruticosus</i> (Blackberry).	n/a
11	n/a	Exotic grassland	33	33	Exotic grassland with majority comprising of <i>Axonopus fissifolius</i> (Crabgrass) and <i>Paspalum dilatatum</i> (Paspalum) with various pasture weeds including <i>Senecio madagascariensis</i> (Fireweed) (Photograph 10).	n/a



Photograph 1: PCT 684 – high condition



Photograph 2: PCT 684 – moderate condition



Photograph 3: PCT 684 – low condition



Photograph 4: PCT 1589 moderate condition



Photograph 5: PCT 1589 low condition



Photograph 6: PCT 1718 moderate condition



Photograph 7: PCT 1718 low condition



Photograph 8: PCT 1720 low condition



Photograph 9: PCT 1105 planted



Photograph 10: Exotic grassland

3.2.5. Assessing vegetation integrity

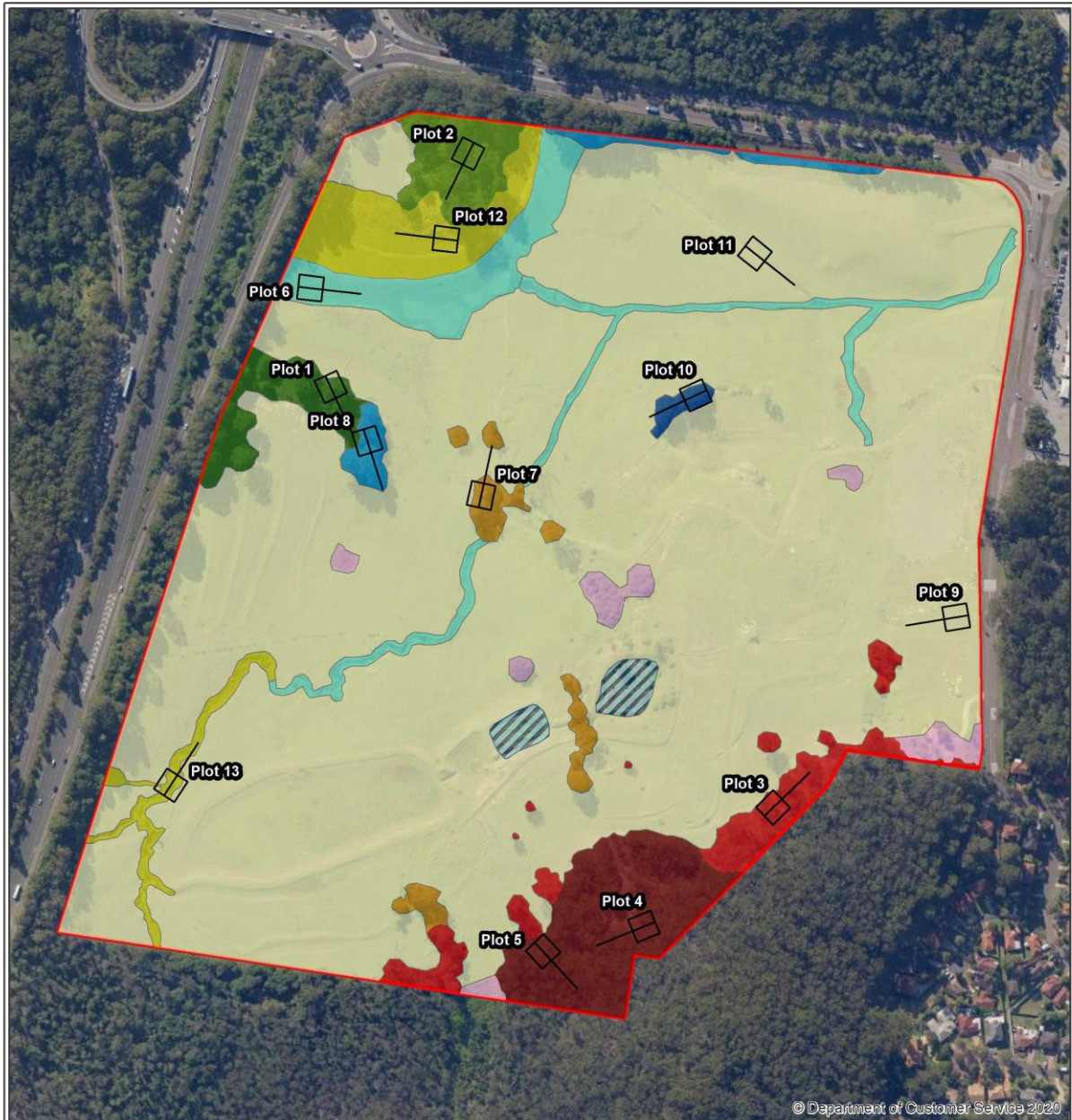
A vegetation integrity assessment using the BAM Calculator (BAMC) was undertaken for the PCTs and zones within the Biocertification area and the results are outlined in Table 12.

Table 12: Vegetation integrity scores

Veg Zone	PCT ID	Condition	Area (ha)	Composition Condition Score	Structure Condition Score	Function Condition Score	Presence of Hollow bearing trees	Current vegetation integrity score
VZ_1	684	Moderate	0.57	29.8	10.3	72	Y	28.1
VZ_2	684	High	0.03	35	25.7	80.5	Y	41.7
VZ_3	684	Low	0.44	27	6.1	0.4	N	4.0
VZ_5	1589	Low	0.28	31	32.8	24.3	Y	29.2
VZ_6	1718	Moderate	0.02	38.3	23.1	55.2	N	36.6
VZ_7	1718	Low	1.56	37.1	56.1	0	N	12.8
VZ_8	1720	Low	0.45	1.8	15.6	61.1	Y	12.0
VZ_9	1105	Planted	0.09	27.7	59.7	74.5	N	49.8

3.2.6. Use of local data

The use of local data has not been proposed for this site.



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Vegetation Zones and Plots

<p>█ BCAA Boundary</p> <p>— Vegetation integrity survey plot</p> <p>Plant Community Types</p> <p>Vegetation Zone 1: 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges northern Sydney Basin Bioregion (High Condition)</p> <p>Vegetation Zone 2: 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges northern Sydney Basin Bioregion (Moderate Condition)</p> <p>Vegetation Zone 3: 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges northern Sydney Basin Bioregion (Low Condition)</p> <p>Vegetation Zone 4: 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast (Moderate Condition)</p>	<p>Vegetation Zone 5: 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast (Low Condition)</p> <p>Vegetation Zone 6: 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Moderate Condition)</p> <p>Vegetation Zone 7: 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Low Condition)</p> <p>Vegetation Zone 8: 1720 - Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast (Low Condition)</p> <p>Vegetation Zone 9: 1105 - River Oak open forest of major streams - Sydney Basin Bioregion and South East Corner Bioregion, Planted</p> <p>Vegetation Zone 10: Exotic</p> <p>Vegetation Zone 11: Exotic</p> <p>▨ Dam</p>	<p>0 50 100 200 Metres</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Datum/Projection: GDA2020 MGA Zone 56 LGA: Central Coast Council Lot//DP: 3//DP1084221, 2//DP1056960 Date: 8/03/2022</p> </div> <div style="text-align: right; margin-top: 10px;"> <p>ATETRA TECH COMPANY</p> </div>
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Figure 10: PCTs, Plots and Vegetation Zones

4. Threatened species

4.1. Methods - Ecosystem credit species

Ecosystem credit species predicted to occur within the development site are generated by the BAMC following the input of VI data and the PCTs identified within Chapter 3. Ecosystem credit species predicted to occur at the BCAA are provided in Appendix G. No Ecosystem species have been excluded from this assessment.

4.2. Methods - Species credit species

4.2.1. Identification of species credit species

Species credit species that require further assessment on the development site (i.e. candidate species), their associated habitat constraints, geographic limitations and sensitivity to gain class is included in Table 13.

Table 13: Candidate species credit species

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded
<i>Acacia bynoeana</i>	Bynoe's Wattle	N/A	None	High	Endangered	Vulnerable	Included
<i>Angophora inopina</i>	Charmhaven Apple	N/A	None	High	Vulnerable	Vulnerable	Included
<i>Anthochaera phrygia</i>	Regent Honeyeater (Breeding)	Other; As per mapped areas	None	High	Critically Endangered	Critically Endangered	Excluded.
<i>Asperula asthenes</i>	Trailing Woodruff	N/A	None	High	Vulnerable	Vulnerable	Included
<i>Burhinus grallarius</i>	Bush Stone-curlew	Fallen/standing dead timber including logs; Null	None	High	Endangered	Not Listed	Included
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	N/A	Known from < 3 locations and/or an AOO < 10 km ² or EOO < 100 km ²	Moderate	Endangered	Vulnerable	Included
<i>Callistemon linearifolius</i>	Netted Bottle Brush	N/A	None	Moderate	Vulnerable	Not Listed	Included
<i>Callocephalon fimbriatum</i>	Gang-gang Cockatoo (Breeding)	Hollow bearing trees; Eucalypt tree species with hollows greater than 9 cm diameter	None	High	Vulnerable	Not Listed	Included
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo (Breeding)	Hollow bearing trees; Living or dead tree with hollows greater than 15cm diameter and greater than 5m above ground.	None	High	Vulnerable	Not Listed	Included
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	N/A	None	High	Vulnerable	Not Listed	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Cliffs; Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.	None	Very High	Vulnerable	Vulnerable	Included
<i>Corybas dowlingii</i>	Red Helmet Orchid	N/A	None	Moderate	Endangered	Not Listed	Included
<i>Crinia tinnula</i>	Wallum Froglet	N/A	None	Moderate	Vulnerable	Not Listed	Excluded
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	N/A	None	Moderate	Vulnerable	Vulnerable	Included
<i>Cynanchum elegans</i>	White-flowered Wax Plant	N/A	None	High	Endangered	Endangered	Included
<i>Diuris bracteata</i>	Diuris bracteata	N/A	Known from < 3 locations and/or an AOO < 10 km ² or EOO < 100 km ²	High	Endangered	Extinct	Included
<i>Diuris praecox</i>	Rough Doubletail	N/A	None	Moderate	Vulnerable	Vulnerable	Included
<i>Eucalyptus glaucina</i>	Slaty Red Gum	N/A	None	Moderate	Vulnerable	Vulnerable	Included
<i>Eucalyptus parramattensis subsp. decadens</i>	Eucalyptus parramattensis subsp. decadens	N/A	Known from 3 - <6 locations and/or an AOO < 500 km ² or EOO < 5000 km ²	High	Vulnerable	Vulnerable	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded
<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> - endangered population	Eucalyptus parramattensis C. Hall. subsp. parramattensis in Wyong and Lake Macquarie local government areas	N/A	None	High	Endangered Population	Not Listed	Included
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	N/A	None	High	Vulnerable	Vulnerable	Included
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (Breeding)	Other; Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	None	High	Vulnerable	Not Listed	Included
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	N/A	None	Moderate	Vulnerable	Vulnerable	Excluded.
<i>Hieraetus morphnoides</i>	Little Eagle (Breeding)	Other; Nest trees - live (occasionally dead) large old trees within vegetation.	None	Moderate	Vulnerable	Not Listed	Included
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	N/A	None	High	Vulnerable	Not Listed	Included
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake (Breeding)	Rocky areas; Including escarpments, outcrops and pagodas within the Sydney Sandstone geologies	None	Very High	Endangered	Vulnerable	Excluded
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	N/A	None	High	Vulnerable	Not Listed	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded
<i>Lathamus discolor</i>	Swift Parrot (Breeding)	Other; As per mapped areas	None	Moderate	Endangered	Critically Endangered	Excluded.
<i>Litoria aurea</i>	Green and Golden Bell Frog	N/A	None	High	Endangered	Vulnerable	Included
<i>Litoria brevipalmata</i>	Green-thighed Frog	N/A	None	Moderate	Vulnerable	Not Listed	Excluded.
<i>Lophoictinia isura</i>	Square-tailed Kite (Breeding)	Other; Nest trees	None	Moderate	Vulnerable	Not Listed	Included
<i>Macropus parma</i>	Parma Wallaby	N/A	None	High	Vulnerable	Not Listed	Included
<i>Maundia triglochinos</i>	Maundia triglochinos	Other; Riparian areas/drainage lines, water ponding, man-made dams and drainage channels up to 1 m deep Semi-permanent/ephemeral wet areas Swamps; Shallow swamps up to 1 m deep Waterbodies; Shallow waterbodies up to 1 m deep	None	High	Vulnerable	Not Listed	Included
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	N/A	None	High	Vulnerable	Vulnerable	Included
<i>Melaleuca groveana</i>	Grove's Paperbark	N/A	None	High	Vulnerable	Not Listed	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded
<i>Miniopterus australis</i>	Little Bent-winged Bat (Breeding)	Caves; Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature.	None	Very High	Vulnerable	Not Listed	Excluded
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (Breeding)	Caves; Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave;" observation type code "E nest-roost;" with numbers of individuals >500	None	Very High	Vulnerable	Not Listed	Excluded
<i>Mixophyes balbus</i>	Stuttering Frog	N/A	None	Very High	Endangered	Vulnerable	Included
<i>Mixophyes iteratus</i>	Giant Barred Frog	N/A	None	Moderate	Endangered	Endangered	Excluded

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded	
<i>Myotis macropus</i>	Southern Myotis	Hollow bearing trees; Within 200 m of riparian zone Other; Bridges, caves or artificial structures within 200 m of riparian zone Waterbodies; This includes rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site	None	High	Vulnerable	Not Listed	Included	
<i>Ninox connivens</i>	Barking (Breeding)	Owl	Hollow bearing trees; Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	None	High	Vulnerable	Not Listed	Included
<i>Ninox strenua</i>	Powerful (Breeding)	Owl	Hollow bearing trees; Living or dead trees with hollow greater than 20cm diameter	None	High	Vulnerable	Not Listed	Included
<i>Pandion cristatus</i>	Eastern (Breeding)	Osprey	Other; Presence of stick-nests in living and dead trees (>15m) or artificial structures within 100m of a floodplain for nesting	None	Moderate	Vulnerable	Not Listed	Included
<i>Persicaria elatior</i>	Tall Knotweed	Semi-permanent/ephemeral wet areas; or within 50 m Swamps;or within 50 m Waterbodies ;including Wetlands, or within 50 m	Known from 3 - <6 locations and/or an AOO < 500 km ² or EOO < 5000 km ²	High	Vulnerable	Vulnerable	Included	

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded
<i>Petalura gigantea</i>	Giant Dragonfly	N/A Swamps; Within 500 m of swamps	None	Very High	Endangered	Not Listed	Excluded
<i>Petauroides volans</i>	Greater Glider	Hollow bearing trees;Null	None	High	Not Listed	Vulnerable	Included
<i>Petaurus norfolcensis</i>	Squirrel Glider	N/A	None	High	Vulnerable	Not Listed	Included
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	N/A Other; Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliffines	None	Very High	Endangered	Vulnerable	Excluded
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	N/A	None	High	Vulnerable	Not Listed	Included
<i>Phascolarctos cinereus</i>	Koala (Breeding)	Other; Areas identified via survey as important habitat (see comments)	None	High	Vulnerable	Vulnerable	Included
<i>Planigale maculata</i>	Common Planigale	N/A	None	High	Vulnerable	Not Listed	Excluded.
<i>Potorous tridactylus</i>	Long-nosed Potoroo	Other; Dense shrub layer or alternatively high canopy cover exceeding 70% (i.e. to capture populations inhabiting wet sclerophyll and rainforest)	None	High	Vulnerable	Vulnerable	Included
<i>Pseudophryne australis</i>	Red-crowned Toadlet	N/A	None	Moderate	Vulnerable	Not Listed	Excluded
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Breeding)	Other; Breeding camps	None	High	Vulnerable	Vulnerable	Excluded.
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	N/A	None	High	Vulnerable	Endangered	Included

Species	Common Name	Habitat Constraints	Geographic limitations	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status	Justification for species to be included or excluded
<i>Rhodamnia rubescens</i>	Scrub Turpentine	N/A	None	High	Critically Endangered	Not Listed	Included
<i>Rhodomyrtus psidioides</i>	Native Guava	N/A	None	High	Critically Endangered	Not Listed	Included
<i>Rutidosis heterogama</i>	Heath Wrinklewort	N/A	None	High	Vulnerable	Vulnerable	Included
<i>Tetradthea glandulosa</i>	Tetradthea glandulosa	N/A	None	High	Vulnerable	Not Listed	Included
<i>Tetradthea juncea</i>	Black-eyed Susan	N/A	None	High	Vulnerable	Vulnerable	Included
<i>Thelymitra adorata</i>	Wyong Sun Orchid	N/A	Known from < 3 locations and/or an AOO < 10 km ² or EOO < 100 km ²	High	Critically Endangered	Critically Endangered	Included
<i>Turnix maculosus</i>	Red-backed Button-quail	N/A	None	High	Vulnerable	Not Listed	Included
<i>Tyto novaehollandiae</i>	Masked Owl (Breeding)	Hollow bearing trees; Living or dead trees with hollows greater than 20cm diameter.	None	High	Vulnerable	Not Listed	Included
<i>Uperoleia mahonyi</i>	Mahony's Toadlet	N/A	None	High	Endangered	Not Listed	Included
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	Caves; Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds."	None	Very High	Vulnerable	Not Listed	Included

4.2.2. Candidate species excluded from further assessment

Any species excluded from the assessment and relevant justification is provided below in Table 14. According to BAM 5.2.3 – 2 (a) species may be excluded from assessment if one of the following applies;

- i. “the assessor determines that microhabitats required by a species are absent from the subject land (or specific vegetation zone). The assessor must include a description of the microhabitats assessed as being required by the species in the BAR. This must be based on evidence such as published literature, or
- ii. the assessor determines that the habitat constraints or microhabitats are degraded to the point that the species is unlikely to use the subject land (or specific vegetation zones)”.

Table 14: Species excluded from assessment

Species	Justification for exclusion
Regent Honeyeater (<i>Anthochaera phrygia</i>) (Breeding)	BCAR boundary not within DPIE mapped areas (as accessed by BOAMS on 01/02/2022).
Wallum Froglet (<i>Crinia tinnula</i>)	According to DPIE (2020a), this Wallum Froglet require <i>still waterbodies located in acid swamplands (pH<5.5), wallum heaths, open vegetation on sand plains, and flooded areas of swamp forests within the PCTs associated with the species.</i> Habitats within the Biocertification Area are considered too degraded hydrologically to maintain an acid swamp environment.
Giant Burrowing Frog (<i>Heleioporus australiacus</i>)	<p>According to DPIE (2020a) suitable breeding habitat consists of <i>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.</i> Non-breeding habitat is native vegetation adjacent to the breeding sites. This species prefers clean, unpolluted waters (Green, 1997) and are generally found within 300m of breeding sites (OEH 2017a).</p> <p>Due to the degraded nature of vegetation within the Biocertification area, suitable habitat/breeding habitat, necessary for this species was not considered present. Breeding sites were also considered unlikely to be adjacent to the BCAA. Spotlighting during the survey period (September to May) also did not detect this species.</p>
Broad-headed Snake (<i>Hoplocephalus bungaroides</i>) (Breeding)	According to OEH (2021c), Broad-headed Snakes shelter in <i>rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring.</i> The move from the sandstone rocks to shelters in cervices or hollows in large trees within 500m of escarpments in summer. The Biocertification Area does not contain habitat for this species, with the absence of sandstone rocks or cliffs and limited hollow bearing trees for shelter. Surveys during December did not detect this species.
Swift Parrot (<i>Lathamus discolor</i>) (Breeding)	BCAR boundary not within DPIE mapped areas (as accessed by BOAMS on 01/02/2022).
Green-thighed Frog (<i>Litoria brevipalmata</i>)	According to DPIE (2020a) suitable breeding habitat for Green-thighed Frog is any semi-permanent or ephemeral waterbody of >25 square metres in surface area located within native vegetation or immediately adjacent to native vegetation. They typically breed in pools that form in depressions or old ox-bows in native forest areas and particularly wet forests types on the Central Coast, but they will breed in roadside gutters and flooded grasslands next to native forest. Non-breeding habitat is native vegetation adjacent to the breeding habitat where frogs feed and shelter in dense vegetation and leaf litter. Areas of relatively intact native vegetation are required to support non-breeding activities,

Species	Justification for exclusion
	presumably because they provide dense moist shelter (Lemckert, F. 2022, pers. comm.). The density of exotic ground and mid-storey adjacent to waterbodies within the Biocertification area is considered unsuitable for this species, which does not appear to use patchy and more disturbed native vegetation as shelter (Lemckert, F. 2022, pers. comm.). In addition, main roads to the north and west are considered to be significant barriers to frog species in general, greatly limiting movement between patches of habitat outside of the BCAA and vegetation within the BCAA itself.
Little Bent-winged Bat (<i>Miniopterus australis</i>) (Breeding)	Breeding habitat for this species is caves, tunnels, mines or other structures known or suspected to be used by <i>M. australis</i> including species records in the NSW BioNet Atlas with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature (OEH 2018). Breeding habitat is not present within the Biocertification area, nor is habitat such as caves, tunnels or mines which are likely to be in use by this species within the vicinity of the BCAA.
Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>) (Breeding)	Breeding habitat for this species is caves, tunnels, mines or other structures known or suspected to be used by <i>M. australis</i> including species records in the NSW BioNet Atlas with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature (OEH 2018). Breeding habitat is not present within the Biocertification Area, nor is habitat such as caves, tunnels or mines which are likely to be in use by this species within the vicinity of the BCAA.
Giant Barred Frog (<i>Mixophyes iteratus</i>)	Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, favouring deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor (OEH 2017b). Permanent streams are not present within the Biocertification Area, nor is suitable leaf litter present for refuge. The habitat is considered too degraded to support this species.
Giant Dragonfly (<i>Petalura gigantea</i>)	This species requires permanent swamps and bogs with some free water and open vegetation (OEH 2021d). These swamps are required for breeding, with larvae being slow growing and larval stages lasting up to 10 years or more. Permanent swamps are not present within the Biocertification Area.
Brush-tailed Rock-wallaby (<i>Petrogale penicillata</i>)	According to (OEH 2003), this species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. They shelter or bask during the day in rock crevices, caves and overhangs and are most active at night when foraging. Suitable habitat for this species is absent from the Biocertification Area and therefore this species is unlikely to occur. In addition, surveys conducted failed to detect any evidence of this species presence.
Red-crowned Toadlet (<i>Pseudophryne australis</i>)	According to DPIE (2020a) this species is found only on Triassic sandstones, and within that area, it uses areas of heathland and woodland. Suitable breeding habitat consists of ephemeral streams or pools located within areas of native vegetation on Triassic sandstones. Non-breeding habitat is native vegetation within 100 metres of suitable breeding habitat. Both breeding and non-breeding habitat is not considered to be present within the Biocertification Area due to the lack of sandstone and suitable native vegetation.
Common Planigale (<i>Planigale maculata</i>)	Common Planigale inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water (OEH 2022). Bionet records indicate that this species has not been recorded as south as Fern Bay, with records predominantly located within heathland and rainforest dominated areas. Habitat for this species is not present within the Biocertification Area, nor within the BCAA.
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) (Breeding)	Breeding camps are not present within the Biocertification Area.

4.2.3. Candidate species requiring further assessment

All species specified as 'Included' in Table 13 require assessment for the Biocertification area and were targeted with species specific surveys. The timing of these surveys was determined by the survey months specified in the BAMC and Bionet. These surveys are detailed within the following sections.

4.3. Survey Methods: Targeted surveys

4.3.1. Targeted Flora Surveys

Where suitable habitat was identified for candidate threatened flora species, targeted flora surveys were undertaken consistent with the *NSW Surveying threatened plants and their habitats* (DPIE 2020b) and within the seasonal requirements outlined in the Threatened Biodiversity Database Collection (TBDC). According to Section 5.1 Several threatened plant species may be searched for during the same traverse. To ensure detectability is not compromised it is recommended that multi-species searches be restricted to a maximum of five species in the same stratum (i.e. search for five ground species, five mid-layer species or five canopy species) per traverse. Multi-species surveys could also be grouped further, by genus, similar growth form, or species with other similar characteristics where they are likely to occupy the same stratum (DPIE 2020b).

To note, a maximum of 5 species per stratum per survey event is a recommendation only, to ensure detectability is not compromised, however, is considered dependent on the habitat suitability and conditions of the site.

The site has been surveyed appropriately for each respective threatened flora species that were likely to occur based on the degraded nature of the habitat on site. Highly experienced flora ecologists capable of undertaking comprehensive surveys for multiple species were utilised for these surveys, with particular emphasis placed on those species considered most likely to occur based on detailed habitat assessments.

A detailed list of flora survey and target species is provided in Table 15 with the required survey timing and survey event indicated in green.

Targeted survey tracks are presented in Figure 11. Targeted flora surveys involved walking in parallel transects with a separation width of 10 m within open areas of vegetation and at a separation of 5 m in denser vegetation. Where suitable micro habitat features were identified for species such as orchids (e.g. edges of tracks and open areas), more intensive searches were undertaken. Survey tracks for April 2021 and November 2021 were random meanders through suitable habitat, completed above that required for specified targeted survey periods (July/August/September/December).

Table 15: Target flora surveys

Candidate species	BC Status	EPBC Status	Survey timing												Comments	
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<i>Acacia bynoeana</i>	E	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
<i>Angophora inopina</i>	V	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
<i>Asperula asthenes</i>	V	V	N	N	N	N	N	N	N	N	N	Y	Y	Y	Y	
<i>Caladenia tessellata</i>	E	V	N	N	N	N	N	N	N	N	N	Y	Y	N	N	
<i>Callistemon linearifolius</i>	E	-	Y	N	N	N	N	N	N	N	N	Y	Y	Y	Y	
<i>Corybas dowlingii</i>	E	-	N	N	N	N	N	Y	Y	N	N	N	N	N	N	
<i>Corunastylis</i> sp. Charmhaven (NSW896673)	CE	CE	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	
<i>Cryptostylis hunteriana</i>	V	V	Y	N	N	N	N	N	N	N	N	N	N	Y	Y	-
<i>Cynanchum elegans</i>	E	E	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-
<i>Diuris bracteata</i>	E	Ex	N	N	N	N	N	N	N	N	Y	Y	N	N	N	-
<i>Diuris praecox</i>	V	V	N	N	N	N	N	N	N	N	Y	N	N	N	N	-
<i>Eucalyptus glaucina</i>	V	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Non-cryptic
<i>Eucalyptus parramattensis</i>	V	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Non-cryptic
<i>Genoplesium insigne</i> <u>EPBC</u> <u>Act: Corunastylis insigne</u>	CE	CE	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	Surveyed outside of known flowering period based on Ecologist Shawn Ryan checking reference population and species observed flowering. Bionet profile states: <i>Flowering time is variable depending on recent rainfall and is limited to about 2 weeks. Survey when a nearby reference population is in flower.</i> Also surveyed in conjunction with the September 2021 surveys
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	

Candidate species	BC Status	EPBC Status	Survey timing												Comments	
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
<i>Maundia triglochinos</i>	V	-	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	-	
<i>Melaleuca biconvexa</i>	V	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	
<i>Melaleuca groveana</i>	V	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-	
<i>Persicaria elatior</i>	V	V	Y	Y	Y	Y	Y	Y	N	N	N	N	N	Y	-	
<i>Rhizabthella slateri</i>	V	E	N	N	N	N	N	N	N	N	N	Y	Y	Y	N	-
<i>Rhodamnia rubescens</i>	CE	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-
<i>Rhodomyrtus psidioides</i>	CE	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-
<i>Rutidosis heterogama</i>	V	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	-
<i>Tetratheca glandulosa</i>	V	-	N	N	N	N	N	N	N	N	Y	Y	Y	Y	N	-
<i>Tetratheca juncea</i>	V	V	N	N	N	N	N	N	N	N	N	Y	Y	N	N	-
<i>Thelymitra adorata</i>	CE	CE	N	N	N	N	N	N	N	N	N	Y	Y	N	N	-

4.3.2. Targeted Flora – Survey Effort

Targeted surveys effort (total effort hours) for species credit species were undertaken within the BCAA on the dates outlined in Table 16. The location of targeted surveys are shown on Figure 11, with the results of the surveys shown as individual species polygons on Figure 13.

Table 16: Targeted flora surveys and effort

Dates	Surveyors	Target species	Methods employed	Total effort
7-8 April 2021	Shawn Ryan and Janene Devereux	General field observation for non-cryptic flora species observable at all times of year i.e. <i>Melaleuca biconvexa</i> , <i>Rhodamnia rubescens</i> .	Random meander across suitable habitat	32 person hours
12 July 2021	Shawn Ryan	<i>Corybas dowlingii</i> , <i>Melaleuca biconvexa</i> , <i>Melaleuca groveana</i>	10m transects across suitable habitat	8 person hours
9-13 August 2021	Daniel Watts Carolina Mora	<i>Cynanchum elegans</i> , <i>Genoplesium insigne</i> , <i>Grevillea parviflora</i> subsp. <i>Parviflora</i> , <i>Diuris bracteata</i> , <i>Diuris praecox</i> , <i>Melaleuca biconvexa</i> , <i>Melaleuca groveana</i> , <i>Rutidosis heterogama</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i>	10m transects across suitable habitat	32 person hours
27 – 28 September 2021	Shawn Ryan	<i>Acacia bynoeana</i> , <i>Angophora inopina</i> , <i>Caladenia tessellata</i> , <i>Cynanchum elegans</i> , <i>Diuris bracteata</i> , <i>Eucalyptus glaucina</i> , <i>Eucalyptus parramattensis</i> , <i>Genoplesium insigne</i> , <i>Grevillea parviflora</i> subsp. <i>Parviflora</i> , <i>Melaleuca biconvexa</i> , <i>Melaleuca groveana</i> , <i>Rhizabthella slateri</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i> , <i>Rutidosis heterogama</i> , <i>Tetratheca glandulosa</i> , <i>Tetratheca juncea</i> , <i>Thelymitra adorata</i>	10m transects across suitable habitat	16 person hours
19 November 2021	Shawn Ryan	General field observation for non-cryptic flora species observable at all times of year, however, presence of early flowering cryptic species such as <i>Cryptostylis hunteriana</i> and <i>Asperula asthenes</i> was undertaken during this period.	Random meander across suitable habitat	8 person hours
13 – 17 December 2021	Shawn Ryan Liam Scanlan	<i>Cryptostylis hunteriana</i> , <i>Asperula asthenes</i> , <i>Cynanchum elegans</i> , <i>Maundia triglochinoidea</i> , <i>Melaleuca biconvexa</i> , <i>Melaleuca groveana</i> , <i>Persicaria elatior</i> , <i>Rutidosis heterogama</i> , <i>Rhodamnia rubescens</i> , <i>Rhodomyrtus psidioides</i>	10m transects across suitable habitat	32 person hours

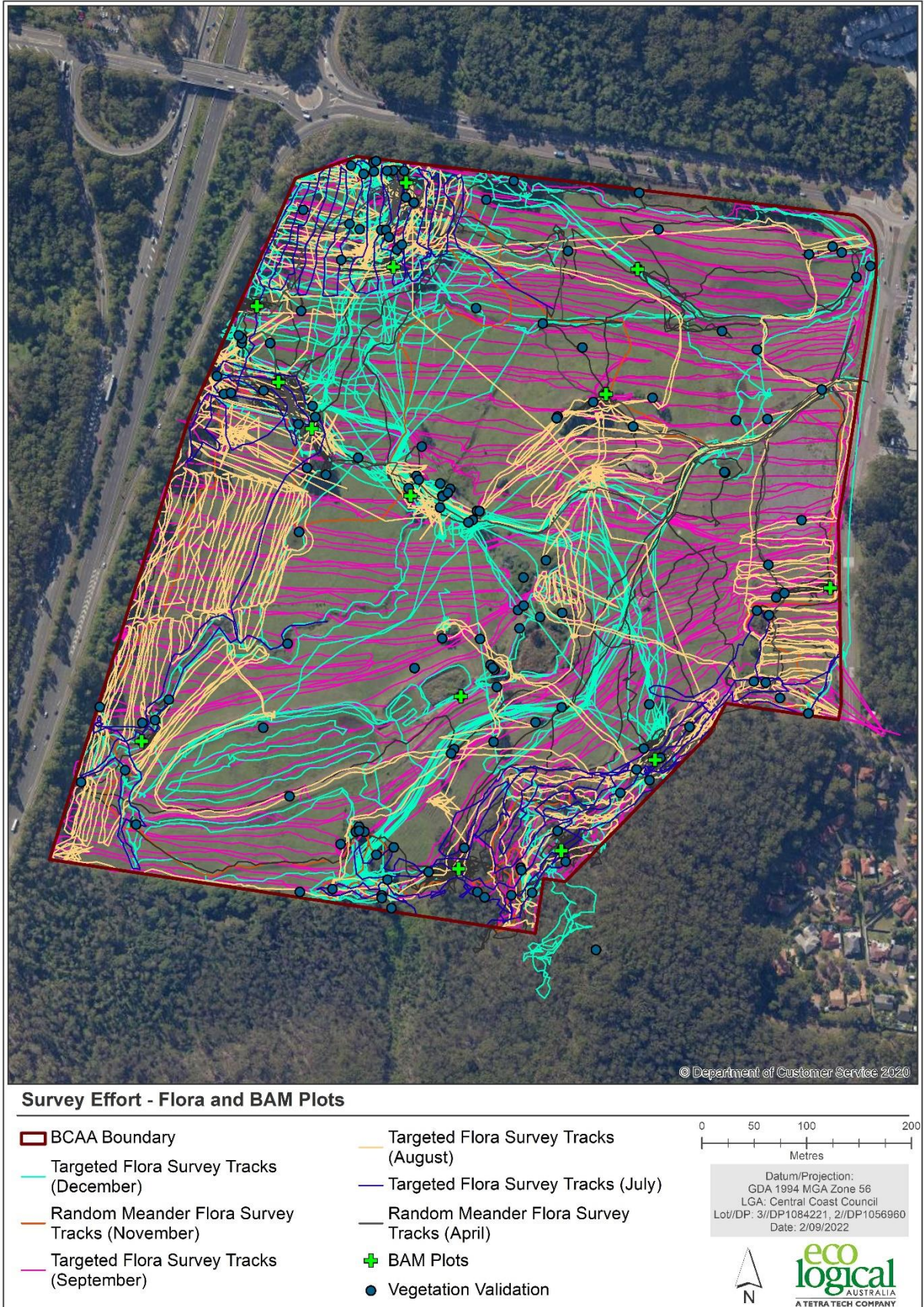


Figure 11: Threatened flora survey effort

4.3.3. Targeted Fauna Surveys Methodology

Targeted fauna survey methodology was undertaken in accordance with the following documents:

- *'Species credit' threatened bats and their habitats, NSW survey guide for the Biodiversity Assessment Method* (OEH 2018)
- *Survey Guide for Threatened Frogs, A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE 2020a)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft* (DEC 2004).
- *BioNet Threatened Biodiversity Data Collection (TBDC) (BioNet 2021)*

The BCAA is approximately 41.7 ha in size, with the Biocertification area approximately 35.38 ha and 33 ha of this comprising exotic grassland. Under the 2004 draft survey guidelines, minimum fauna survey effort is required per 50 ha unit. Therefore, the BCAA contained one 'survey unit'. Additional survey effort was applied to address the spatial separation and patchiness of the areas of native vegetation within the BCAA. The combination of fauna survey methods for ground trapping and bird surveys therefore exceeds the minimum requirements of the 2004 draft survey guidelines. Where available, species-specific survey requirements (which overrule the 2004 draft survey guidelines) as per Bionet (2021), were adhered to for this assessment. Further details on the methodologies utilised are provided below.

4.3.3.1. Fauna Habitat Assessment

During vegetation survey and site assessments, habitat features for threatened fauna were identified and mapped within the BCAA. This informed the methodology for targeted surveys. Habitat features of interest included:

- Hollow-bearing trees (see Photograph 11).
- Nests, including nests for raptors.
- Feed trees for birds and mammals.
- Riparian areas and waterbodies (see Photograph 12).
- Suitable roost trees for owls.



Photograph 11: A hollow bearing tree within the proposed Biocertification Area

4.3.3.2. Bird Surveys and Stag Watches

Targeted fauna surveys were conducted in August and December to locate both diurnal and nocturnal bird species listed:

- Glossy Black-Cockatoo (*Calyptorhynchus lathami*)
- White-bellied Sea Eagle (*Haliaeetus leucogaster*)
- Little Eagle (*Hieraaetus morphnoides*)
- Eastern Osprey (*Pandion cristatus*)
- Square-tailed Kite (*Lophoictinia isura*)
- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)

Diurnal bird surveys covering an area of approximately 1 ha for a duration of 20 minutes, were conducted on eight occasions in August and seven occasions in December. All species observed or heard in that time were recorded.

Availability of habitat is limited within the Biocertification Area, with few large hollow bearing trees present. Stag watches were conducted at suitable hollow bearing trees within the BCAA.

4.3.3.3. Spotlighting and Call Playback

Nocturnal surveys involved the use of call playback and spotlighting at multiple locations across the site. These surveys were conducted over eight nights in August 2021. Calls were played for threatened nocturnal birds and mammals, including:

- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)

- Bush Stone-curlew (*Burhinus grallarius*)
- Koala (*Phascolarctos cinereus*)

Call playback sequence included calls of all target species, with periods of 2-5 mins of continuous calls broadcast at ~ 110% of natural volume interspersed with periods (2-5 mins) of silence to listen between each species.

Call playback was conducted over eight (8) nights, in order to meet the survey effort provided in Table 5.7 of the DEC 2004 guidelines, which suggests five nights for Powerful Owls, six nights for Sooty Owl and eight nights for Masked Owl. Spotlighting searches on foot followed each call playback event – searching for a number of species:

- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Masked Owl (*Tyto novaehollandiae*)
- Bush Stone-curlew (*Burhinus grallarius*)
- Koala (*Phascolarctos cinereus*)
- Eastern Pygmy-possum (*Cercartetus nanus*)
- Parma Wallaby (*Macropus parma*)
- Greater Glider (*Petauroides volans*)
- Squirrel Glider (*Petaurus norfolcensis*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)

The locations of the surveys are provided in Figure 12.

Nocturnal surveys across August and December also aimed to detect Red-backed Button-quail (*Turnix maculosus*). This species is quite cryptic and rarely recorded. Nocturnal searches did not flush any quails, nor were any detected during 10 m parallel transects completed during flora surveys.

4.3.3.4. Terrestrial mammal survey

Two traplines of five ground Elliot A traps were deployed (Figure 12). Traps were arranged in areas of potential small mammal habitat. A total of 40 trap nights were undertaken. Insulated traps were baited with a mixture of peanut butter, honey and oats. Traps were covered with a plastic bag in the event of rain. Species targeted using arboreal Elliot A traps were:

- Eastern Pygmy Possum (*Cercartetus nanus*)
- New Holland Mouse (*Pseudomys novaehollandiae*)

4.3.3.5. Amphibian surveys

Aural-visual surveys were completed along the edges of suitable frog habitat (along creeklines and damp/inundated grassland areas). These surveys involved spotlighting for individuals as well as surveyors listening for calls (in silence and darkness) and using call playback to illicit a response. These surveys were repeated over four nights (Figure 12). An example of open water within the Biocertification Area is provided in Photograph 12 below.



Photograph 12: Open water along the western edge of the proposed Biocertification Area

4.3.3.6. Reptile searches

Reptile searches targeted Pale-headed Snake (*Hoplocephalus bitorquatus*) and Stephens' Banded Snake (*Hoplocephalus stephensii*). Availability of habitat is limited within the Biocertification Area, with few large hollow bearing trees. Nocturnal surveys during the appropriate time (December) involved spotlighting within available habitat (i.e. within areas of hollow bearing trees) and along creek lines. Surveys for Pale-headed Snake are required to occur one – two days after rainfall on humid nights. Surveys were conducted from December 13th to 17th, with over 50 mm of rainfall falling on December 10th and less than 1 mm falling on both December 11th and 12th.

4.3.3.7. Remote Cameras

Eleven¹ remote cameras were set across the BCAA between 13 December 2021 – 23 February 2022 (73 nights; a total of 657 camera trapping nights). Cameras were set approximately 1.7 m up a tree, pointed towards bait fixed to another nearby tree. Traps were baited with a mixture of peanut butter, honey and oats and sprayed with honey water. Specific requirements for Brush-tailed Phascogale involved a minimum of 4 cameras for sites up to 1 ha, then an additional 2 cameras for every ha of potential habitat thereafter (eleven cameras across 2.45 ha of habitat). Cameras must be evenly spaced across the site. Where potential habitat is disconnected by gaps of 50 m or more, each habitat patch should have a minimum of 4 cameras for the first ha, and 2 cameras for every ha thereafter. This method also targets other species, including:

- Eastern Pygmy-possum (*Cercartetus nanus*)
- Koala (*Phascolarctos cinereus*)
- Brush-tailed Phascogale (*Phascogale tapoatafa*)

¹ Two cameras were stolen during field surveys and therefore data was only collected from nine cameras.

4.3.3.8. Microchiropteran Bat Surveys

Targeted surveys for microchiropteran bats were conducted over four nights using four harp traps (16 trap nights) (see **Photograph 13** for an example) and six Song Meter Mini Bat Ultrasonic Recorders (24 detector nights). The locations of the survey equipment in Figure 12. Species targeted during surveys were:

- Large-eared Pied Bat (*Chalinolobus dwyeri*)
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Little Bentwing-bat (*Miniopterus australis*)
- Southern Myotis (*Myotis macropus*)
- Eastern Cave Bat (*Vespadelus troughtoni*)



Photograph 13: Example of Harp Traps

4.3.4. Targeted Fauna – Survey Effort

Targeted surveys for species credit species were undertaken at the required survey timing as provided in Table 17 with actual survey event in green. The dates of surveys are provided in Table 18. The location of targeted surveys are shown on Figure 12, with the results of the surveys shown as individual species polygons on Figure 14.

Table 17: Required survey timing for candidate fauna species

Species name	Common name	BC Status	EPBC Status	Survey timing												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
<i>Burhinus grallarius</i>	Bush Stone-curlew	E	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Collocephalon fimbriatum</i>	Gang-gang Cockatoo (Breeding)	V	E	Y	N	N	N	N	N	N	N	N	N	Y	Y	Y
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo (Breeding)	V	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	V	-	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	Y
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	V	V	Y	N	N	N	N	N	N	N	N	N	N	Y	Y
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (Breeding)	V	-	N	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y
<i>Hieraetus morphnoides</i>	Little Eagle (Breeding)	V	-	N	N	N	N	N	N	N	N	Y	Y	Y	N	N
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	V	-	Y	Y	Y	N	N	N	N	N	N	N	N	Y	Y
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	V	-	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	Y
<i>Litoria aurea</i>	Green and Golden Bell Frog	E	-	Y	Y	Y	N	N	N	N	N	N	N	N	Y	Y
<i>Lophoictinia isura</i>	Square-tailed Kite (Breeding)	V	-	Y	N	N	N	N	N	N	N	N	Y	Y	Y	Y
<i>Macropus parma</i>	Parma Wallaby	V	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Mixophyes balbus</i>	Stuttering Frog	E	-	Y	Y	Y	N	N	N	N	N	N	Y	Y	Y	Y
<i>Myotis macropus</i>	Southern Myotis	V	-	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	Y
<i>Ninox connivens</i>	Barking Owl (Breeding)	V	-	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Ninox strenua</i>	Powerful Owl (Breeding)	V	-	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N
<i>Pandion cristatus</i>	Eastern Osprey (Breeding)	V	-	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
<i>Petauroides volans</i>	Greater Glider	-	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Petaurus norfolcensis</i>	Squirrel Glider	V	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	V	-	Y	Y	Y	Y	Y	Y	N	N	N	N	N	N	Y
<i>Phascolarctos cinereus</i>	Koala (Breeding)	V	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Species name	Common name	BC Status	EPBC Status	Survey timing												
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	V	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Pseudophryne australis</i>	Red-crowned Toadlet	V	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Turnix maculosus</i>	Red-backed Button-quail	V	-	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
<i>Tyto novaehollandiae</i>	Masked Owl (Breeding)	V	-	N	N	N	N	Y	Y	Y	Y	Y	N	N	N	N
<i>Uperoleia mahonyi</i>	Mahony's Toadlet	E	-	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	Y
<i>Vespdelus troughtoni</i>	Eastern Cave Bat	V	-	Y	N	N	N	N	N	N	N	N	N	N	Y	Y

Table 18: Targeted fauna survey and effort

Dates	Surveyors	Target species	Methods employed	Total effort
3, 4 & 5, 11-12 and 17, 18 & 19 August 2021	Daniel Watts Carolina Mora	Glossy Black-Cockatoo, White-bellied Sea Eagle, Little Eagle, Eastern Osprey, Square-tailed Kite,	Diurnal bird census	4 person hours
		Barking Owl, Powerful Owl, Masked Owl, Sooty Owl, Bush Stone-curlew, Squirrel Glider, Koala, Red-backed Button-quail	Call playback	18 person hours over 8 nights
		Barking Owl, Powerful Owl, Masked Owl, Sooty Owl, Greater Glider, Squirrel Glider, Koala	Spotlighting	16 person hours over 8 nights
3 August	Daniel Watts	Barking Owl, Powerful Owl, Masked Owl, Sooty Owl, Squirrel Glider	Stag Watch	2 person hours
13 – 17 December 2021	Shawn Ryan Liam Scanlan	Bush Stone-curlew, Gang-gang Cockatoo, Glossy Black-Cockatoo, White-bellied Sea-Eagle, Little Eagle, Square-tailed Kite	Diurnal bird census	4.5 person hours
		Greater Glider, Squirrel Glider, Koala, Parma wallaby, Potoroo, Red-backed Button-quail	Spotlighting	8 person hours
		Gang-gang Cockatoo, Glossy Black-Cockatoo	Stag Watch	4 person hours
		Eastern Pygmy-possum	Elliot traps A	40 trap nights
		Large-eared Pied Bat, Little Bent-winged Bat, Large Bent-winged Bat, Southern Myotis, Eastern Cave Bat	Harp traps	16 trap nights
		Stuttering Frog, Giant Barred Frog, Mahony's Toadlet, Green and Golden Bell Frog	Acoustic detectors	24 trap nights
			Aural-visual surveys along transects	8 person hours
	Pale-headed Snake and Stephens' Banded Snake	Habitat searches	8 person hours	
13 December 2021 – 23 February 2022	Shawn Ryan Liam Scanlan	Eastern Pygmy-possum, Brush-tailed Phascogale, Koala	Remote Cameras	730 trapping days

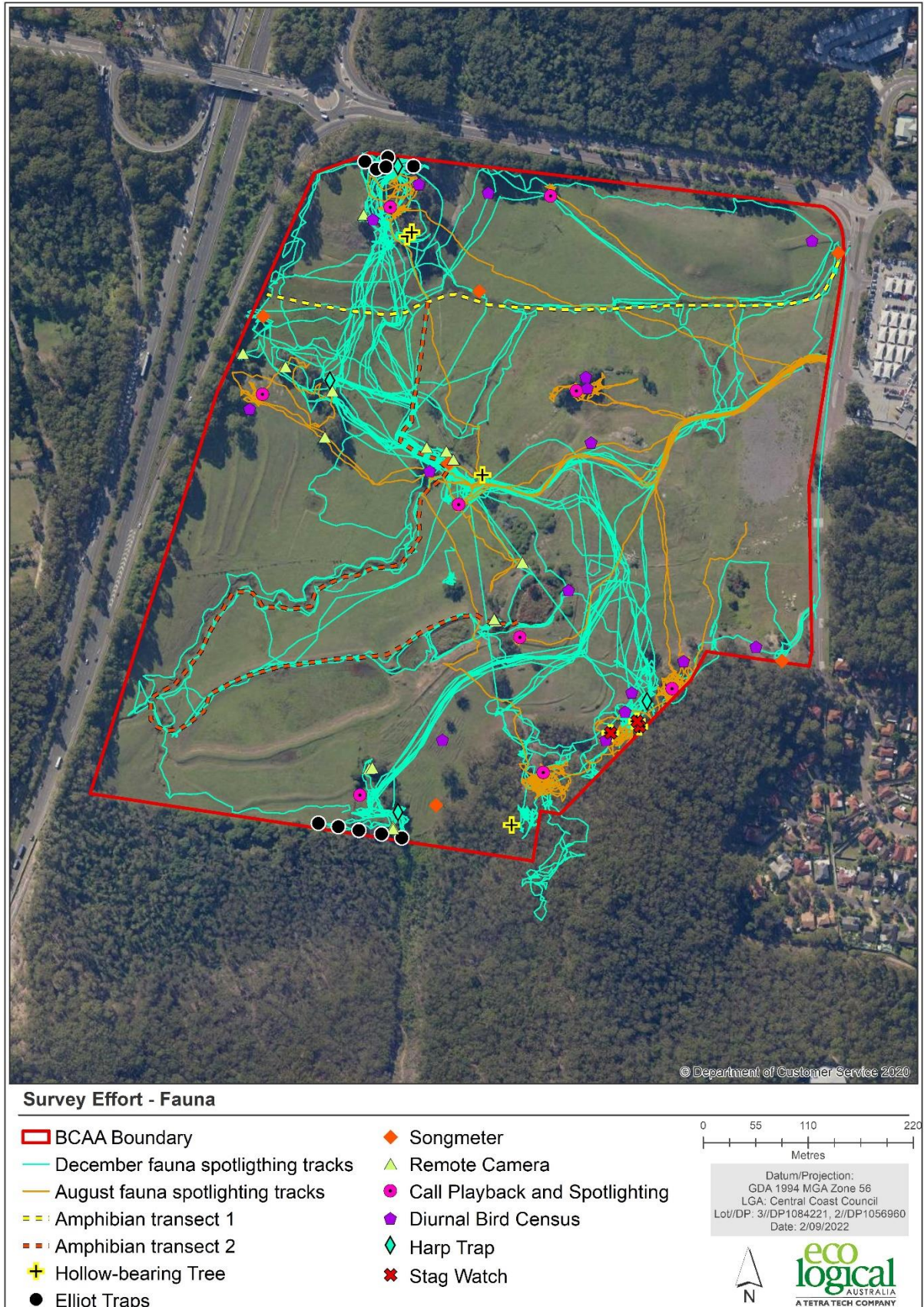


Figure 12: Targeted fauna survey effort

4.4. Weather conditions

Weather conditions during the targeted surveys are outlined in Table 19.

Table 19: Weather conditions

Date	Rainfall (mm)	Minimum temperature °C	Maximum temperature °C
7/04/2021	0.0	17.5	24.6
8/04/2021	34.6	17.5	24.6
20/04/2021	0.0	7.9	23.0
10/05/2021	0.2	12.2	24.6
12/07/2021	2.0	5.9	17.5
9/08/2021	4.4	9.8	18.9
10/08/2021	0.0	6.0	22.5
11/08/2021	0.0	13.7	23.5
12/08/2021	0.0	13.6	20.5
13/08/2021	0.0	4.8	19.4
27/09/2021	10.6	6.8	18.6
28/09/2021	0.0	7.7	22.1
19/11/2021	0.0	16.3	28.4
13/12/2021	0.0	15.6	23.2
14/12/2021	0.0	13.4	24.4
15/12/2021	0.0	13.5	29.1
16/12/2021	2.8	20.2	24.4
17/12/2021	0.0	18.9	24.9

4.5. Limitations

There are no limitations or assumptions associated with surveys completed.

A discussion of where multiple species were surveyed simultaneously in relation to threatened flora can be found in Section 4.3.1.

ELA holds a current scientific licence to conduct fauna surveys. This licence is issued by the NSW DPE and place an obligation upon us to submit all survey and incidental records to the DPE for inclusion in their databases (primarily the Bionet Atlas of NSW Wildlife).

4.6. Use of local data

The use of local data has not been proposed for this site.

5. Threatened Species

5.1. Results

Survey methods for each species credit species are detailed below in Table 20. Species results and subsequent assessments are also provided within this table. Comprehensive details on the requirements of species polygons are provided below in Section 5.2.

Table 20: Results of targeted surveys

Species Name	Common Name	Survey method	Result	Assessment
<i>Acacia bynoeana</i>	Bynoe's Wattle	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Angophora inopina</i>	Charmhaven Apple	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Asperula asthenes</i>	Trailing Woodruff	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Burhinus grallarius</i>	Bush Stone-curlew	Call playback Spotlighting	Not detected within the Biocertification area	No further assessment required
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Callistemon linearifolius</i>	Netted Bottle Brush	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Collocephalon fimbriatum</i>	Gang-gang Cockatoo (Breeding)	Diurnal Bird Census	Not detected within the Biocertification area	No further assessment required
<i>Calyptorhynchus lathami</i>	Glossy Black-Cockatoo (Breeding)	Diurnal Bird Census	Not detected within the Biocertification area	No further assessment required
<i>Cercartetus nanus</i>	Eastern Pygmy-possum	Remote Cameras Spotlighting	Not detected within the Biocertification area	No further assessment required
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat	Harp traps Acoustic detectors	Not detected within the Biocertification area	No further assessment required
<i>Corybas dowlingii</i>	Red Helmet Orchid	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Crinia tinnula</i>	Wallum Froglet	Aural-visual surveys	Not detected within the Biocertification area	No further assessment required
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Cynanchum elegans</i>	White-flowered Wax Plant	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Diuris bracteata</i>	Diuris bracteata	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Diuris praecox</i>	Rough Doubletail	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Eucalyptus glaucina</i>	Slaty Red Gum	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required

Species Name	Common Name	Survey method	Result	Assessment
<i>Eucalyptus parramattensis</i> subsp. <i>decadens</i>	Eucalyptus parramattensis subsp. <i>decadens</i>	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Eucalyptus parramattensis</i> subsp. <i>parramattensis</i> - <i>endangered</i> population	Eucalyptus parramattensis C. Hall. subsp. <i>parramattensis</i> in Wyong and Lake Macquarie local government areas	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	Small-flower Grevillea	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle (Breeding)	Diurnal Bird Census	Not detected within the Biocertification area Stick nests were also not detected.	No further assessment required
<i>Hieraaetus morphnoides</i>	Little Eagle (Breeding)	Diurnal Bird Census	Not detected within the Biocertification area. Stick nests were also not detected.	No further assessment required
<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	Targeted habitat survey	Not detected within the Biocertification area	No further assessment required
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake (Breeding)	Targeted habitat survey	Not detected within the Biocertification area	No further assessment required
<i>Hoplocephalus stephensii</i>	Stephens' Banded Snake	Targeted habitat survey	Not detected within the Biocertification area	No further assessment required
<i>Litoria aurea</i>	Green and Golden Bell Frog	Aural-visual surveys	Not detected within the Biocertification area	No further assessment required
<i>Lophoictinia isura</i>	Square-tailed Kite (Breeding)	Diurnal Bird Census	Not detected within the Biocertification area. Stick nests were also not detected.	No further assessment required
<i>Macropus parma</i>	Parma Wallaby	Remote cameras	Not detected within the Biocertification area	No further assessment required
<i>Maundia triglochinos</i>	<i>Maundia triglochinos</i>	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	10m transects across suitable habitat	Detected	Species offset polygon detailed in Section 5.1.1
<i>Melaleuca groveana</i>	Grove's Paperbark	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Miniopterus australis</i>	Little Bent-winged Bat (Breeding)	Harp traps Acoustic detectors	Detected using acoustic detectors.	Detailed in Section 5.1.2
<i>Miniopterus orianae oceanensis</i>	Large Bent-winged Bat (Breeding)	Harp traps Acoustic detectors	Detected using acoustic detectors.	Detailed in Section 5.1.2

Species Name	Common Name	Survey method	Result	Assessment
<i>Mixophyes balbus</i>	Stuttering Frog	Aural-visual surveys	Not detected within the Biocertification area	No further assessment required
<i>Mixophyes iteratus</i>	Giant Barred Frog	Aural-visual surveys	Not detected within the Biocertification area	No further assessment required
<i>Myotis macropus</i>	Southern Myotis	Harp traps Acoustic detectors	Detected using acoustic detectors.	Species offset polygon detailed in Section 5.1.2
<i>Ninox connivens</i>	Barking Owl (Breeding)	Call Playback Spotlighting	Not detected within the Biocertification area	No further assessment required
<i>Ninox strenua</i>	Powerful Owl (Breeding)	Call Playback Spotlighting	Not detected within the Biocertification area	No further assessment required
<i>Pandion cristatus</i>	Eastern Osprey (Breeding)	Diurnal Bird Census	Not detected within the Biocertification area	No further assessment required
<i>Persicaria elatior</i>	Tall Knotweed	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Petalura gigantea</i>	Giant Dragonfly	Opportunistic surveys through available habitat	Not detected within the Biocertification area	No further assessment required
<i>Petauroides volans</i>	Greater Glider	Spotlighting Remote Cameras	Not detected within the Biocertification area	No further assessment required
<i>Petaurus norfolcensis</i>	Squirrel Glider	Spotlighting Remote Cameras Call playback	Not detected within the Biocertification area	No further assessment required
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Spotlighting Remote Cameras	Not detected within the Biocertification area	No further assessment required
<i>Phascogale tapoatafa</i>	Brush-tailed Phascogale	Spotlighting Remote Cameras	Not detected within the Biocertification area	No further assessment required
<i>Phascolarctos cinereus</i>	Koala (Breeding)	Spotlighting Remote Cameras Call playback	Not detected within the Biocertification area	No further assessment required
<i>Potorous tridactylus</i>	Long-nosed Potoroo	Spotlighting Remote Cameras	Not detected within the Biocertification area	No further assessment required
<i>Pseudophryne australis</i>	Red-crowned Toadlet	Aural-visual surveys	Not detected within the Biocertification area	No further assessment required
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox (Breeding)	Opportunistic surveys at dawn/dusk	Not detected within the Biocertification area	No further assessment required
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Rhodamnia rubescens</i>	Scrub Turpentine	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Rhodomyrtus psidioides</i>	Native Guava	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required

Species Name	Common Name	Survey method	Result	Assessment
<i>Rutidosia heterogama</i>	Heath Wrinklewort	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Tetratheca glandulosa</i>	<i>Tetratheca glandulosa</i>	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Tetratheca juncea</i>	Black-eyed Susan	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Thelymitra adorata</i>	Wyong Sun Orchid	10m transects across suitable habitat	Not detected within the Biocertification area	No further assessment required
<i>Turnix maculosus</i>	Red-backed Button-quail	Diurnal bird surveys	Not detected within the Biocertification area	No further assessment required
<i>Tyto novaehollandiae</i>	Masked Owl (Breeding)	Spotlighting Call playback	Not detected within the Biocertification area	No further assessment required
<i>Uperoleia mahonyi</i>	Mahony's Toadlet	Aural-visual surveys	Not detected within the Biocertification area	No further assessment required
<i>Vespadelus troughtoni</i>	Eastern Cave Bat	Harp traps	Not detected within the Biocertification area	No further assessment required

5.2. Species credit species offsets and polygons

As specified in Table 20 above, four species credit species were recorded within the BCAA. Species credit species that are present on the proposed Biocertification area are outlined in the sections below.

5.2.1. Flora species credit species

Melaleuca biconvexa (Biconvex Paperbark) was recorded along the northern edge of the proposed Biocertification area (see Figure 13). This species is relatively common within the Gosford-Wyong area, generally growing in damp places (such as PCT 1718). This species is a species credit species and therefore requires offsets (see Table 21 below). Offsets for *M. biconvexa* are generated by the areas of the associated PCTs (moderate condition PCT 1718) within the Biocertification area (see Table 21 and Figure 13).

Areas of PCT 1718 Low condition are considered too degraded and do not provide habitat for this species.

5.2.2. Fauna species credit species

Bat call analysis recorded 'possible' calls for *Myotis macropus*. 'Definite' calls were recorded for *Miniopterus australis* and *Miniopterus orianae oceanensis*. *Scoteanax rueppellii* was also recorded, however is an ecosystem species and offsets are therefore attributed to appropriate PCTs. No further assessment is required.

According to the Bat call analysis report (Corymbia Ecology, Amy Rowles (2022))- *Myotis macropus* 'possible' calls were recorded as only a couple of passes for each detector (four out of six detectors). If *Myotis macropus* is present, activity was considered to be low. The precautionary principal has been applied with regards to this species, and an offset has been calculated. *M. macropus* species polygons are applied to *habitat on the subject land within 200m of a waterbody with pools/ stretches 3m or wider*

(see Photograph 12). The area (ha) within this polygon is provided in Table 21 below and shown in Figure 14.

In determining the species polygon, the area of water considered suitable is marginal forging habitat and not considered a permanent body of water. As part of initial vegetation surveys, this portion of the site was damp grassland and did not comprise the necessary width/length of waterbody, however, after continued recent rainfall, this area has formed into a stretch of water consistent with the above habitat dimensions (200m length; 3m wide), and so has been assessed as habitat. The 200m buffer has been centered on this waterbody, and only areas of PCT comprising actual habitat suitable to this species i.e. PCT 684 high, moderate and Low; PCT 1105 planted, PCT 1718 moderate and PCT 1720 low have been assessed as the species polygon for *M. macropus*. The area of habitat within the rocky area, to be retained i.e. land proposed for conservation (proposed C2) will not be impacted, therefore has not been included in calculations.

Miniopterus australis and *Miniopterus orianae oceanensis* are species credit species, however foraging habitat for these species is assessed as an ecosystem credit; with only the breeding habitat requiring species credits. Breeding habitat for these species (caves, tunnels, mines etc) is not present within the Biocertification area. Evidence of breeding activity (i.e. lactating females caught using harp traps) was also not detected within the Biocertification area during harp trapping. No known breeding areas exist within the vicinity of the Biocertification area, however potential roosting habitat for this species may be present within 2km of the Biocertification area in the form of engineered rock faces along the edge of the M1 motorway (see Section 4.4.1). Although this area may provide some roosting habitat, fissures along these rock faces are unlikely to provide a suitable depth to support a roosting/breeding population, and are most likely repaired regularly to maintain their integrity and reduce any risk of rock fall on the motorway.

Also of note; Glossy Black Cockatoos were recorded within the BCAA, however were not recorded within the proposed Biocertification area. The recorded individuals were utilising *Allocasuarina* stands in off-site habitat. A juvenile was present with adults, resulting in stag watches conducted at suitable hollows within the Biocertification area to detect if these hollows were in use by this species. Stag watches did not detect any use by Glossy Black Cockatoos and therefore breeding is not considered present within the Biocertification area. As there is no impact to breeding habitat for this species, no offsets or further assessment are required.

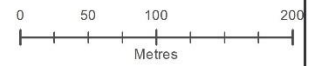
Table 21: Species credit species included in the assessment

Species	Common Name	Species presence	Geographic limitations	Habitat (ha)	Biodiversity Risk Weighting
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	Yes (surveyed)	NA	0.02	2.0
<i>Myotis macropus</i>	Southern Myotis	Yes (surveyed)	NA	2.00	2.0



Melaleuca biconvexa Species Polygon

- ▭ BCAA Boundary
- Certified land
- Land subject to conservation measures
- *Melaleuca biconvexa* (BioNet Atlas)
- *Melaleuca biconvexa* (ELA)
- ▭ 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Moderate Condition) (0.02 ha)



Datum/Projection:
 GDA2020 MGA Zone 56
 LGA: Central Coast Council
 Lot/DP: 3//DP1084221, 2//DP1056960
 Date: 11/12/2023



Figure 13: Species polygons – *Melaleuca biconvexa*

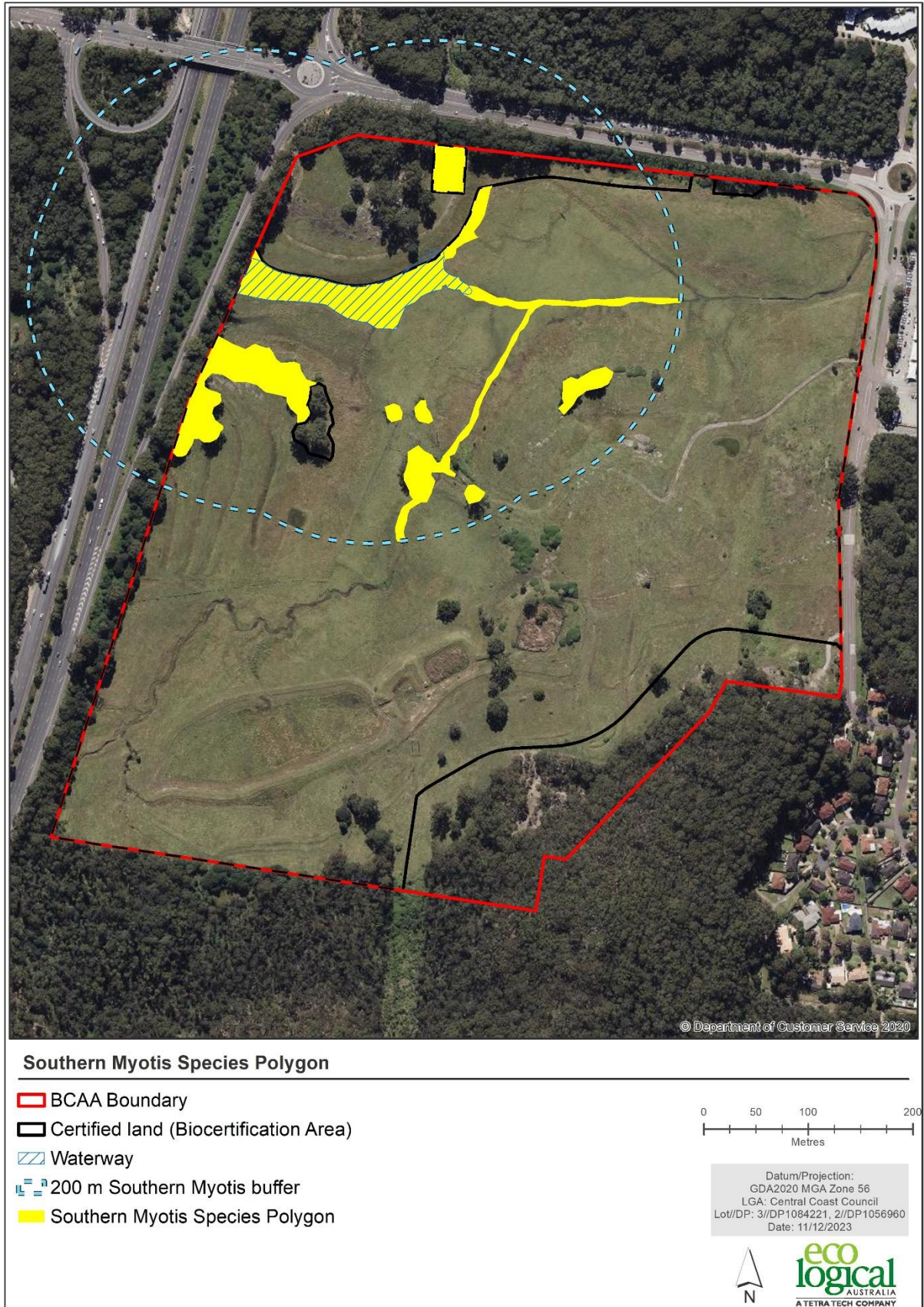


Figure 14: Species polygon – Southern Myotis

5.3. Identification of prescribed additional biodiversity impact entities

Prescribed impacts for the proposed Biocertification area are detailed below.

5.3.1. Karst, caves, crevices, cliffs, rocks and other geological features of significance

Karst, caves, crevices, cliffs, rocks and other geological features of significance are not present within the Biocertification area.

Cliffs are present within the vicinity of the BCAA, in the form of with engineered rock faces within 100m (see Photograph 14 and Figure 15 below for context). Crevices and cracks in this rock face may provide some habitat for cave roosting bats such as *Miniopterus australis* (Little Bent-winged Bat) or *Miniopterus orianae oceanensis* (Large Bent-winged Bat) which were recorded (as a definite call) within the Biocertification area. No breeding roosts are present within the Biocertification area, and habitat adjacent to the BCAA is not considered likely to provide any breeding habitat opportunities, likely due to the insufficiency of depth within the engineered rock faces along the highway.



Photograph 14: Snapshot taken from Google Maps (<https://www.google.com/maps>) of potential bat habitat within the vicinity of the BCAA



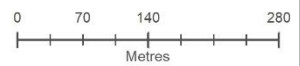
Engineered cliff face mapping

- ▭ BCAA Boundary
- ▬ Engineered rock faces

Plant Community Types

- ▭ Vegetation Zone 1: 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges northern Sydney Basin Bioregion (High Condition)
- ▭ Vegetation Zone 2: 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges northern Sydney Basin Bioregion (Moderate Condition)
- ▭ Vegetation Zone 3: 684 - Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges northern Sydney Basin Bioregion (Low Condition)
- ▭ Vegetation Zone 4: 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast (Moderate Condition)

- ▭ Vegetation Zone 5: 1589 - Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast (Low Condition)
- ▭ Vegetation Zone 6: 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Moderate Condition)
- ▭ Vegetation Zone 7: 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Low Condition)
- ▭ Vegetation Zone 8: 1720 - Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast (Low Condition)
- ▭ Vegetation Zone 9: 1105 - River Oak open forest of major streams - Sydney Basin Bioregion and South East Corner Bioregion, Planted
- ▭ Vegetation Zone 10: Exotic (Shrubs)
- ▭ Vegetation Zone 11: Exotic Grassland



Datum/Projection:
GDA2020 MGA Zone 56
LGA: Central Coast Council
Lot//DP: 3//DP1084221, 2//DP1056960
Date: 03-Mar-22



Figure 15: Engineered cliff face mapping

5.3.2. Human-made structures and non-native vegetation

No human-made structures or exotic vegetation utilised by threatened entities (as determined by targeted surveys) will be impacted within the Biocertification area.

5.3.3. Habitat connectivity

Habitat connectivity is patchy through the Biocertification area, with scattered paddock trees providing some connectivity from the north to the south of the Biocertification area (Figure 1). This connectivity may be used by a number of more mobile species, largely being diurnal birds and larger mammals. The removal of these small vegetation patches is not likely to significantly reduce connectivity through the landscape.

5.3.4. Water bodies, water quality and hydrological processes

Waterbodies within the Biocertification area comprise of one 1st Order stream (Mardi Creek) which enters the BCAA along the western boundary and comprises an unformed shallow channel that runs from east to west through exotic grassland. The high-level design proposes to restore Mardi Creek, which currently provides marginal foraging resources, along its original alignment and re-establish the riparian corridor. The creek, at its widest, may be utilised by the threatened species Southern Myotis. Roosts for this species were not identified within the Biocertification area, nor was this species captured during harp trapping during targeted surveys. There are several dams within the Biocertification area, however, most have limited foraging potential due to surface weed infestations or comprise any native vegetation on the periphery suitable for this species.

5.3.5. Vehicle strikes

The proposed Biocertification area will predominantly support residential development. Increased residential development will increase the number of vehicles travelling through the BCAA and increasing the risk of vehicle strike on threatened species and other native fauna.

Stage 2: Impact Assessment (biodiversity values and Prescribed Impacts)

6. Avoid and Minimise Impacts on Biodiversity Values

6.1. Avoid and Minimise Direct and Indirect Impacts

6.1.1. Project Location

The development has been located in a way which avoids and minimises impacts as outlined in Table 22. Initial vegetation surveys aimed to identify the biodiversity constraints within the BCAA and aimed to identify where opportunities existed for avoidance of the higher biodiversity values.

The development has been located to avoid impacts to areas of higher biodiversity value, where possible, including the avoidance of intact vegetation situated on land currently zoned as RU6: Transition comprising the remnant vegetation within the rocky outcrops of the northern portion of the BCAA. It is proposed that this area be rezoned to C2: Environmental Conservation as part of the DA. Areas of existing C2: Environmental Conservation in the southern portion of the BCAA, as per the requirements of that zoning, have been retained with additional areas proposed to augment this C2 zoning (Figure 5). These areas will be managed as part of 'land proposed for conservation measures'.

As discussed in Section 1.5 the Proponent has undertaken detailed consultation with both Hunter Central Coast Branch Biodiversity and Conservation Division (BCD) and Central Coast Council, with one of the key matters being demonstration of further avoidance measures across the BCAA. As a result, the Proponent has amended the flooding/civil design for waterways, including Mardi Creek. This re-aligned creek line will now allow further avoidance (86%) of PCT 1718 'Moderate' along the Northern boundary of the BCAA. Additionally, no individuals of *M. biconvexa* will be impacted.

Additionally, subsequent to the meeting held on 06/12/2023 between the Proponent, BCD and Council, additional area has been added to the 'Land proposed for Conservation' along the northern boundary bordering Wyong Road. This area will form part of the buffer along the re-designed Mardi Creek. A visual representation of this is shown in Figure 7.

All biodiversity values identified in this area, comprising of PCT 1718 Moderate condition (EEC) and *Melaleuca biconvexa* individuals will be managed under a VMP, ensuring these values are retained and protected from any impacts associated with the re-construction of Mardi Creek. A Restoration Ecologist specialising in creek restoration and restoration planting will be engaged to develop and implement the VMP.

Table 22: Locating a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed and justification
Locating the proposal (including ancillary facilities) in areas lacking biodiversity values	Using the initial constraints mapping of areas of low, moderate and high biodiversity value – the proposal has been located predominantly within areas categorised as low (i.e. low biodiversity value). Areas of high biodiversity value have been largely avoided (predominantly areas in the northwest and southeast). Additionally, the majority of PCT 1718 Moderate condition (EEC) will be retained, comprising of vegetation along the northern boundary and a small, isolated pocket of remnant trees. These areas will be subject to

Approach	How addressed and justification
<p>Locating the proposal (including ancillary facilities) in areas where the native vegetation or threatened species habitat is in the poorest condition</p>	<p>management for conservation and is designated on the Concept plan for the BCAA for retention.</p> <p>Figure 8 illustrates the large areas of cleared and modified land across the BCAA, with approximately 88% of land proposed for impact in the Biocertification area categorised as cleared, modified and of low biodiversity value. These areas are considered less likely to provide habitat for native species and threatened species.</p>
<p>Locating the proposal (including ancillary facilities) in areas that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC, a highly cleared PCT or an entity at risk of a serious and irreversible impact (SAIL)</p>	<p>PCT 1718 conforms to the EEC <i>Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> listed under the BC Act. PCT 1720 conforms to the EEC <i>River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions</i> listed under the BC Act, however does not conform to the requirements in the listing advice for the EPBC Act <i>Critically Endangered River- flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria</i>. Native midstorey or groundcover is no longer present within this small patch, which comprises of a native canopy and exotic groundlayer.</p> <p>A small portion of PCT 1718 Moderate condition will be retained and subject to management for conservation. This small, isolated pocket of remnant trees will be retained and is designated on the Concept plan for the BCAA for retention.</p> <p>Both of these EEC's are relatively degraded due to past clearing and agricultural practises. Due to the location of these areas within the central portion and northern portions of the Biocertification area, complete avoidance was not achievable with the footprint proposed, however significant additional avoid and minimise efforts have been made by the Proponent.</p> <p>The Biocertification area would impact one flora species credit species (species polygon) (habitat only) with a biodiversity risk weighting of 2. <i>Melaleuca biconvexa</i> (Biconvex Paperbark) individuals are located along the disturbed northern boundary of the Biocertification area. No clearing of individuals is proposed, however, clearing of 0.02 ha of habitat is required for the northern road access.</p> <p>The Biocertification area would impact one fauna species credit species (species polygon) with a biodiversity risk weighting of 2 being Southern Myotis. A very small portion of PCT 1718 Low condition provides potential foraging habitat. The high level design proposes to restore Mardi Creek along its original alignment and re-establish the riparian corridor. This is proposed to improve habitat and foraging resources for this species.</p>
<p>Locating the proposal in areas outside of the buffer area around breeding habitat features such as nest trees or caves</p>	<p>No evidence of nest trees/breeding was recorded within the BCAA, therefore no known breeding habitat buffer areas will be impacted.</p>

6.1.2. Project design

The development has been designed in a way which avoids and minimises impacts as outlined in Table 23.

Table 23: Designing a project to avoid and minimise impacts on vegetation and habitat

Approach	How addressed and justification
Reducing the proposal's clearing footprint by minimising the number and type of facilities	The planning proposal scope went through multiple revisions following initial constraints assessments. Constraint's mapping, including the identification of threatened species within the BCAA (such as <i>M. biconvexa</i>) resulted in updates to the design of the Biocertification area to avoid one area of <i>M. biconvexa</i> and a large portion of higher value habitat in the northwest and southeast.
Locating ancillary facilities in areas that have no biodiversity values	Approximately 88% of all vegetation impacts are confined to areas with little to no biodiversity values.
Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores)	Approximately 88% of all vegetation impacts are confined to areas with little to no biodiversity values (exotic grasslands). These areas are considered to provide minimal habitat for threatened flora and fauna due to the intensity of grazing and exotic cover. The substation has been located mostly within PCT 684 Low condition, with a small portion extending into PCT 684 Moderate condition.
Locating ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g. an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII))	The substation has been located mostly within PCT 684 Low condition, with a small portion extending into PCT 684 Moderate condition. This PCT does not conform to any listed TECs or provide habitat for any entities considered at risk of a SAII.
Actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.	The Proponent is proposing to establish and implement a Vegetation Management Plan (VMP) across the northern and southern portions of the site, with a small remnant area of PCT 1718 (moderate) also included to fall under this VMP. This would conserve the larger areas of more intact better quality vegetation present within the BCAA. The southern portion of the site, which connects to larger more intact vegetation to the south, is considered to provide better quality habitat for potential threatened species.

6.2. Avoid and Minimise Prescribed Impacts

6.2.1. Project location

The development has been located in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 24.

Table 24: Locating a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed and justification
Locate surface works to avoid direct impacts on the habitat features	The Biocertification area does not comprise any identified breeding habitat i.e. caves/cliffs etc. Surface works will predominantly occur within cleared exotic grassland areas (88%). Removal of habitat features such as hollow bearing trees, located in scattered remnants through the center of the Biocertification area will require removal, however, as discussed, these hollows were not identified as habitat for threatened species.
Locating the envelope of sub-surface works, both in the horizontal and vertical plane, to avoid and minimise operations	The proposed development within the Biocertification area will not require substantial sub-surface works that would alter ground flow or hydrological

Approach	How addressed and justification
beneath the habitat features, e.g. locating long wall panels away from geological features of significance or water dependent plant communities and their supporting aquifers	processes that affect the long term viability of the vegetation communities outside of the BCAA.
Locating the project to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths to important habitat or preferred local movement pathways	Connectivity across the BCAA is already highly fragmented, with partial connectivity from the north to the south through the centre of the BCAA comprising small disturbed vegetation patches and paddock trees. The removal of this vegetation in the Biocertification area will not interfere with migratory flight paths to important habitat. No migratory paths have been identified within the Biocertification area.

6.2.2. Project design

The development has been designed in a way which avoids and minimises prescribed biodiversity impacts as outlined in Table 25.

Table 25: Designing a project to avoid and minimise prescribed biodiversity impacts

Approach	How addressed and justification
Design of project elements to minimise interactions with threatened entities	Threatened entity <i>M. biconvexa</i> was identified along the northern boundary of the BCAA. Updates to the design of the Biocertification area were undertaken to avoid all impacts to <i>M. biconvexa</i> individuals. This area, and habitat for <i>M. biconvexa</i> will form part of the VMP for the site. The overall design of the site has included an 'Active Open Space' area close to the western boundary in order to retain the small remnant patch of PCT 1718 (moderate condition) which is the BC Act listed Swamp Sclerophyll Forest.
Maintain environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation	The high level design proposes to restore Mardi Creek, which provides marginal foraging resources, along its original alignment and re-establish the riparian corridor to be utilised by threatened species (such as Southern Myotis).
Maintain hydrological processes that sustain threatened entities	The high level design proposes to restore Mardi Creek, which provides marginal foraging resources, along its original alignment and re-establish the riparian corridor to be utilised by threatened species (such as Southern Myotis).
Controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities	Detailed stormwater modelling and treatment plan should be undertaken at the DA stage and mitigation measures implemented to ensure stormwater quantity and quality from the future development does not impact the receiving environment. In response to Council's concerns, the Proponent have tested the design to a level that would ordinarily be expected in a Development Application submission to ensure no significant impacts to water quality releases will occur.

7. Assessment of Impacts

7.1. Direct impacts

The direct impacts of the development on:

- Native vegetation and threatened ecological communities are outlined in Table 26. Not included as native vegetation impacts are Exotic vegetation (33ha) and a Dam (0.31 ha).
- Threatened species and threatened species habitat is outlined in Table 27.
- Prescribed biodiversity impacts are outlined in Section 7.4.

The Planning Proposal is to facilitate development of the site for residential and public open spaces purposes represented at a high level in Figure 5. Such development will result in the clearing of vegetation within the proposed Biocertification area for earthworks, construction works, lay-down areas, heavy vehicle turning bay and site facilities. Mitigation and management measures will reduce the risk of any impact outside of this boundary.

Direct impacts including the final project footprint (construction and operation) are shown on Figure 5.

Table 26: Direct impacts to native vegetation

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	BC Act listing	EPBC Act listing	Direct impact (ha)
684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	Not listed	Not listed	1.04
1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	Eastern Riverine Forests	Forested Woodlands	N/A	N/A	0.09
1589	Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast	Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Not listed	Not listed	0.28
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Coastal Swamp Forests	Forested Wetlands	Swamp Sclerophyll Forest EEC	N/A	1.70
1720	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	Coastal Floodplain Wetlands	Forested Wetlands	River-Flat Eucalypt Forest EEC	N/A	0.45

Table 27: Direct impacts on threatened species and threatened species habitat

Species	Common Name	Direct impact habitat (ha)	BC Act listing status	EPBC Act Listing status
<i>Melaleuca biconvexa</i>	Biconvex paperbark	0.02	Vulnerable	Vulnerable
<i>Myotis macropus</i>	Southern myotis	2.00	Vulnerable	Not Listed

7.2. Change in vegetation integrity

The change in vegetation integrity as a result of the development is outlined in Table 28.

Table 28: Change in vegetation integrity

Veg Zone	PCT ID	Condition	Area (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity
VZ_1	684	High	0.57	41.7	0	-41.7
VZ_2	684	Moderate	0.03	28.1	0	-28.1
VZ_3	684	Low	0.44	4.0	0	-4.0
VZ_5	1589	Low	0.28	29.2	0	-29.2
VZ_6	1718	Moderate	0.02	36.6	0	-36.6
VZ_7	1718	Low	1.56	12.8	0	-12.8
VZ_8	1720	Low	0.45	12.0	0	-12.0
VZ_9	1105	Planted	0.09	49.8	0	-49.8

7.3. Indirect impacts

The indirect impacts of the development are outlined in Table 29.

Table 29: Indirect impacts

Indirect impact	Nature (nature, and extent)	Frequency	Biodiversity affected	Duration/ Timing	Consequence & Mitigation Measures
Inadvertent impacts on adjacent habitat or vegetation	Damage to adjacent habitat and vegetation including TECs and threatened species as a result of construction or operation of development.	Daily during construction and operational phase of the project with increased residential activity adjacent to retained vegetation.	Native vegetation, threatened species habitats	Daily, during construction phase.	Moderate Degradation of native vegetation, TECs and threatened species habitat. Mitigation and management measures will be outlined within the Construction Environmental Management Plan (CEMP), and Vegetation Management Plan (VMP).
Reduced viability of adjacent habitat due to edge effects	Location of residential development directly adjacent to retained vegetation has the potential to result in degradation of habitat and vegetation due to edge effects.	Operational phase of the project with increased residential activity adjacent to retained vegetation.	Native vegetation, threatened species habitats	Daily, for the life of the development	Moderate Degradation of native vegetation, TECs and threatened species habitat. Mitigation and management measures will be outlined within the CEMP and VMP.
Reduced viability of adjacent habitat due to noise and dust or light spill	Noise and dust created from machinery Impacts to foraging behaviour for Southern Myotis due to	Daily during construction.	Fauna species and their habitats	Daily, during construction phase.	Low Short term impacts. The BCAA is located adjacent to a large highway and a shopping centre and is subject to low level noise impacts currently. Noise and dust from the construction process and subsequent development is unlikely to cause a significant impact to fauna.

Indirect impact	Nature (nature, and extent)	Frequency	Biodiversity affected	Duration/ Timing	Consequence & Mitigation Measures
Reduced viability of adjacent habitat due to light spill	Impacts of lighting near waterways	Daily during operational phase of the project.		Daily, for the life of the development	Moderate Impacts of lighting near Mardi Creek re-aligned waterway is to be minimised. Alternative lighting must be used near waterways such as red lights or motion activated lighting to reduce impacts on Southern Myotis foraging behaviour.
Transport of weeds and pathogens from the site to adjacent vegetation	Spread of weed seed and pathogens from incoming machinery and equipment. Spread of weeds from use of roads, garden escapes, increased human activity adjacent to retained vegetation.	Daily during construction.	Native vegetation	Long term impacts during construction and operational phase	Moderate Increased weed spread. Weed and pathogens to be managed under a CEMP and VMP.
Increased risk of starvation or exposure and loss of shade or shelter	No increase of starvation or exposure or loss of shade and shelter expected.	Daily during construction.	n/a	n/a	Low Localised loss of fauna. Native woodland vegetation removal within the Biocertification area comprises approximately 1.70 ha with large areas of adjacent habitat available, the risk of starvation or exposure is considered to be negligible.
Loss of breeding habitat	Small areas of native vegetation will be removed, resulting in the loss of minimal hollows that may provide habitat for common fauna species.	Daily, during construction.	Fauna species, no listed threatened fauna species	During the construction phase.	Moderate No threatened fauna breeding habitat was identified during targeted surveys within the BCAA. Impacts to habitat will be managed under a CEMP and VMP.

Indirect impact	Nature (nature, and extent)	Frequency	Biodiversity affected	Duration/ Timing	Consequence & Mitigation Measures
Trampling of threatened flora species	<i>M. biconvexa</i> is the only threatened flora recorded within the BCAA.	Daily, during construction.	Threatened flora	During the construction phase.	Moderate Loss of threatened species and degradation of habitat. Trampling is not expected to occur as individuals are mature trees. All areas of <i>M. biconvexa</i> are to be retained and will be managed under the CEMP and VMP.
Inhibition of nitrogen fixation and increased soil salinity	Loss of nitrogen fixing species within Biocertification area is unlikely to significantly impact nitrogen concentration in adjacent retained vegetation.	n/a	n/a	n/a	n/a
Fertiliser drift	Potential for fertiliser drift from residential lawns/gardens, impacting and degrading the adjacent vegetation communities. Increased nutrients from fertiliser may impact native species and promote weed growth.	Operational phase of the project with increased residential activity adjacent to retained vegetation.	Adjacent native vegetation	The life of the project	Low Degradation and increase in weed species in retained vegetation. Degradation of threatened flora habitat. Fertiliser and increased nutrient levels within the current BCAA are not expected to significantly increase due to the project.
Rubbish dumping	Illegal dumping by workers and public leading to degradation of adjacent vegetation. Potential for rubbish to spread into adjacent vegetation and outside Biocertification area.	Daily during construction and operational phase of the project	Adjacent native vegetation and habitats.	Daily, during the construction phase and any stage during operational phase.	Moderate Degradation of adjacent habitat and vegetation. Will be managed through the CEMP and VMP.

Indirect impact	Nature (nature, and extent)	Frequency	Biodiversity affected	Duration/ Timing	Consequence & Mitigation Measures
Wood collection	Potential for residents to collect wood during operational phase of future residential development.	Daily during construction and operational phase of the project	Fauna species dependent on ground litter.	Daily, during the construction phase and any stage during operational phase.	Low Loss of habitat features for fauna species leading to decline in fauna. There is very little wood available for collection within the Biocertification area. Will be managed through the VMP.
Removal and disturbance of rocks including bush rock	Potential for disturbance during construction phase and for residents to collect bush rock during operational phase of future residential development.	Daily during construction and operational phase of the project	Adjacent native vegetation and habitats.	Daily, during the construction phase and any stage during operational phase.	Low Loss of habitat features for fauna species leading to decline in fauna. There is very little bush rock available for removal or disturbance within the BCAA. Will be managed through the CEMP and VMP.
Increase in predators	Increased residential activity may lead to an increase in pest animals such as cats.	During operational phase of the project	Native fauna	During the life of the project	Moderate Long term decline in native fauna. Will be managed through the VMP.
Increase in pest animal populations	Increased residential activity may lead to an increase in pest animals such as rats.	During operational phase of the project	Native fauna	During the life of the project	Moderate Long term decline in native fauna. Will be managed through the VMP.
Changed fire regimes	The proposal is unlikely to impact the fire regime of the Biocertification area or adjacent vegetation that would lead to inadvertent biodiversity impacts.	n/a	n/a	n/a	n/a

Indirect impact	Nature (nature, and extent)	Frequency	Biodiversity affected	Duration/ Timing	Consequence & Mitigation Measures
Disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds.	No disturbance to any specialist breeding habitats are likely.	n/a	n/a	n/a	n/a
sedimentation and contaminated and/or nutrient rich run-off	Future development within the Biocertification area may increase runoff during construction and operation resulting in pollution and degradation of adjacent creek and waterways. Ongoing impacts due to increased hard surfaces and loss of vegetation associated with residential development will potentially lead to increased quantity and pollutants in stormwater runoff	During operational phase of the project	Adjacent vegetation and TECs and threatened species habitat	Any rainfall event during construction and operational phases.	Pollutants/contamination of downstream waterways, degradation of adjacent vegetation communities including TECs. Will be managed through the CEMP and VMP.

7.4. Prescribed biodiversity impacts

The Biocertification area has the prescribed biodiversity impacts as outlined in Table 30.

Table 30: Direct impacts on prescribed biodiversity impacts

Prescribed biodiversity impact	Description (Nature, extent and frequency)	Consequences	Justification	Additional information
Human made structures or non-native vegetation	Non-native (Exotic) vegetation has been recorded within the BCAA. 0.47 ha of exotic shrub/trees and 33 ha of exotic grassland. No Human-made structures are present within the Biocertification area	Removal of non-native vegetation that may provide habitat to common fauna species.	Non-native vegetation may provide minimal habitat such as shelter for small birds and reptiles.	No threatened fauna species were recorded during targeted surveys utilising non-native vegetation. The removal of non-native vegetation is unlikely to significantly impact any fauna species utilising the site.
Habitat connectivity	The proposal will result in the loss of small patches of native vegetation which provide marginal connectivity from the north to the south of the BCAA.	Localised decrease in habitat connectivity.	A narrow yet intact corridor of vegetation runs along the western boundary connecting the northern vegetation to the larger intact vegetation to the south, however, this falls outside of the BCAA boundary.	Connectivity across the BCAA is already highly fragmented, with partial connectivity from the north to the south through the centre of the BCAA comprising small disturbed vegetation patches and paddock trees.
Water bodies, water quality and hydrological processes	One 1 st Order Stream is located in the northwestern portion of the BCAA. This stream is an ephemeral creek and only flows during peak rainfall events. The stream follows a slight drainage depression through the exotic grasslands to the east of the BCAA.	It is proposed to be retained within the Biocertification area, however, will undergo some modification.	No loss of habitat is proposed, however the creekline will undergo modification from its current state.	The proposal is to restore Mardi Creek along its original alignment and re-establish the riparian corridor and the installation of Water Sensitive Urban Design to treat water on site and improve downstream outcomes
Vehicle strikes	The is potential for an increase in the incidence of vehicle strike on threatened and non-threatened species within the BCAA due to increased vehicle activity resulting from residential development.	Localised death or injury to fauna species.	Future residential development following biocertification will result in increased vehicle activity through the subject land and increase potential vehicle strike.	This will be managed through the VMP.

7.5. Mitigating and managing direct and indirect impacts

Measures proposed to mitigate and manage impacts at the development site before, during and after construction are outlined in Table 31.

Table 31: Measures proposed to mitigate and manage impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
timing works to avoid critical life cycle events such as breeding or nursing	Moderate	Low	All hollow-bearing trees within the Biocertification area are assumed to be removed, however, efforts should be made to retain all hollow-bearing trees where possible. Evidence of breeding was not recorded during targeted surveys, however pre-clearance surveys and clearance supervision should be undertaken by suitably qualified ecologist(s) to relocate potential fauna inhabitants and prevent death or injury during tree removal.	Prevent injury or death to native fauna	Prior to and during felling	Contractor, Project Ecologist
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	Moderate	Low	All hollow-bearing trees within the footprint are assumed to be removed, however, efforts should be made to retain all hollow-bearing trees where possible. Evidence of breeding was not recorded during targeted surveys, however pre-clearance surveys and clearance supervision should be undertaken by suitably qualified ecologist(s) to relocate potential fauna inhabitants and prevent death or injury during tree removal.	Prevent injury or death to native fauna	Prior to and during felling	Contractor, Project Ecologist
installing artificial habitats for fauna in adjacent retained vegetation and habitat or human made structures to replace the habitat resources lost and encourage animals to move from the impacted site, e.g. nest boxes	Moderate	Low	Following pre-clearance survey, nest boxes should be installed in the southern portion of 'land proposed for conservation measures' to replace hollows removed at a minimum ratio of 1:1 (i.e. 1 nest box for each hollow removed). Boxes should be chosen to match the potential threatened fauna which may utilise the area. Boxes should be installed prior to construction to allow fauna to move/be relocated to nest boxes prior to removal of hollow-bearing trees and be maintained and monitored for 5 years as part of the VMP.	Provide fauna with compensatory roosting/nesting habitat to replace removed hollow-bearing trees	Prior to construction	Project Ecologist, Project Manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chain-saw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	High	Low	Boundaries of the impact area to be clearly delineated with fencing, retained areas marked with "No Go" signage.	Protection of retained vegetation outside of Biocertification area.	During construction	Project Manager
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	Moderate	Low	Install sediment barriers and erosion control during and post construction to prevent runoff into onsite creeklines. Maintain controls throughout construction and undertake weekly inspections. Detailed stormwater controls should be designed and implemented through the CEMP.	Control of erosion, sedimentation and runoff of contaminated substances into adjacent waterways	Throughout life of project	Project Manager
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	Low	Very Low	Long-term noise impacts have potential to cause low level impacts on fauna occupying adjacent habitat, however, this impact will be minor and cannot be effectively mitigated.	Noise impacts associated with the development will be managed in accordance with the CEMP	During construction	Project manager, contractors
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	Minor	Negligible	Construction works will only be undertaken during daylight hours and night lights will not be used. Lights associated with operation will be directional to avoid unnecessarily shining light into adjacent retained vegetation where possible.	Light impacts of construction will be avoided as all works will occur during daylight hours	Minor	Negligible
adaptive dust monitoring programs to control air quality	Minor	Negligible	Dust suppression measures will be implemented to limit dust on site as per the CEMP.	Mitigate dust created during construction activities	Minor	Negligible

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting	Negligible	Negligible	Not considered necessary for the Biocertification area as breeding or nesting was not recorded during targeted surveys.	NA	NA	NA
fencing to protect significant environmental features such as riparian zones	High	Low	Temporary fencing and signage to be installed at the edge of the Biocertification area to prevent entry into the adjacent vegetation and areas to be retained. Permanent fencing should be established at the interface of the Biocertification area and proposed 'land subject to conservation measures' in the southern portion of the BCAA to prevent ongoing impacts to this area during the operational stage of the development.	No unintended clearing or trampling of adjacent vegetation to be retained.	During construction and operational phase of the development.	Site manager
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	Minor	Negligible	All machinery will be cleaned prior to entering and exiting the Biocertification area to minimise the transport of weeds as per the CEMP. Weeds that are present within the study area that are listed under the NSW Biosecurity Act 2015 will be managed.	Weed impacts managed	During construction	Site manager

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	Minor	Negligible	All personnel working on the project will undertake an environmental induction as part of their site familiarisation. Including: <ul style="list-style-type: none"> - site environmental procedures (vegetation management, sediment and erosion control, exclusion fencing and noxious weeds) - what to do in case of environmental emergency (e.g. chemical spills, fire, injured fauna) - key contacts in the case of an environmental emergency. 	Staff trained and aware of environmental issues and responsibilities on site	Construction	Site manager
development control measures to regulate activity in vegetation and habitat adjacent to residential development including controls on pet ownership, rubbish disposal, wood collection, fire management and disturbance to nests and other niche habitats	Medium	Low	The retained vegetation 'land subject to conservation measures' is proposed to be protected via an instrument under section 88 of the Conveyancing Act 1919, with the development of a 5-year VMP which will outline specific management measures for the protection of retained vegetation.	Protection and management of retained vegetation and habitat.	During and post construction	The Proponent
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	Medium	Low	Ecological restoration and rehabilitation will occur within the 'land subject to conservation measures' with the development of a 5-year VMP which will outline specific management measures for the protection of retained vegetation.	Protection and management of retained vegetation and habitat.	During and post construction	The Proponent

7.6. Mitigating prescribed impacts

Measures proposed to mitigate and manage prescribed biodiversity impacts at the development site before, during and after construction are outlined in Table 32.

Table 32: Mitigation measures for prescribed biodiversity impacts

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Scheduling timing of construction activities to avoid critical life cycle events	n/a	n/a	No threatened fauna have been recorded as utilising habitat within the Biocertification area.	n/a	n/a	n/a
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, and using a trained ecological or licensed wildlife handler during clearing, construction and maintenance activities for human made structures and non-native vegetation	High	Low	<p>Pre-clearing surveys should be undertaken for the removal of any vegetation to remove fauna inhabitants, mark hollow bearing trees and supervise felling.</p> <p>Fencing should be erected around waterbodies adjacent to construction sites.</p> <p>Sediment barriers should be installed in all construction areas to prevent sedimentation and contaminated runoff entering creeklines and downstream wetlands.</p> <p>All contractors should be inducted into the site to be briefed on sensitive environmental features (including threatened flora, TECs and fauna habitat) and responsibilities in avoiding any impacts to retained vegetation.</p>	Minimise injury/death of fauna during vegetation removal.	Prior to and during construction	Project manager / contractor, ecologist
Erecting temporary fencing to protect significant environmental features such as karst, caves, rock outcrops and water bodies	Medium	Low	Fencing should be erected around 'land subject to conservation measures' and waterbodies adjacent to construction sites.	Prevent impacts to retained vegetation, aquatic habitat and waterbodies	During construction	Project manager / contractor

Measure	Risk before mitigation	Risk after mitigation	Action	Outcome	Timing	Responsibility
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	High	Low	Sediment barriers should be installed in all construction areas to prevent sedimentation and contaminated runoff entering creeklines and downstream wetlands.	Prevent sedimentation and contaminated runoff entering creeklines and downstream wetlands.	During construction	Project manager / contractor
Staff training and site briefing to communicate environmental features to be protected and measures implemented to protect them	Medium	Low	All contractors should be inducted into the site to be briefed on sensitive environmental features (including threatened flora, TECs and fauna habitat) and responsibilities in avoiding any impacts to retained vegetation.	Prevent inadvertent damage to retained vegetation and habitat from construction contractors	During construction	Project manager / contractor, ecologist
Ecological restoration, rehabilitation actions and/or maintenance of retained native vegetation on or adjacent to the subject land	Medium	Low	The retained vegetation 'land subject to conservation measures' is proposed to be managed under an 88 instrument of the Conveyancing Act 1919, with the development of a 5-year VMP which will outline specific management measures for the protection of retained vegetation.	Protection and management of retained vegetation and habitat.	During and post construction	
Development control measures that regulate the types of activities that can occur in native vegetation and habitat adjacent to residential development including prohibiting the collection of bush rocks	Medium	Low	Ecological restoration and rehabilitation will occur within the 'land subject to conservation measures' with the development of a 5-year VMP which will outline specific management measures for the protection of retained vegetation including prohibiting the collection of wood and bush rocks.	Protection and management of retained vegetation and habitat.	During and post construction	

8. Impact summary

Following implementation of the BAM and the BAMC, the following impacts have been determined.

8.1. Serious and Irreversible Impacts (SII)

The development does not have any Serious and Irreversible Impact entities (SII) to assess further.

8.2. Impacts requiring offsets

The impacts of the development requiring offset for native vegetation are outlined in Table 33 and shown on Figure 16. The impacts of the development requiring offset for species credit species and their habitat are outlined in Table 34 and on Figure 17 and Figure 18.

Table 33: Impacts to native vegetation that require offsets

Vegetation Zone	PCT ID	PCT Name	Condition	Vegetation Class	Vegetation Formation	Direct impact (ha)
VZ_1	684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	High	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.57
VZ_2	684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	Moderate	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	0.03
VZ_5	1589	Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast	Low	Hunter-Macleay Dry Sclerophyll Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	0.28
VZ_6	1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Moderate	Coastal Swamp Forests	Forested Wetlands	0.02
VZ_9	1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	Planted	Eastern Riverine Forests	Forested Woodlands	0.09

Table 34: Impacts on threatened species habitat that require offsets

Species	Common Name	Direct impact - habitat (ha)	BC Act listing status	EPBC Act Listing status
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	0.02 ha	Vulnerable	Vulnerable
<i>Myotis macropus</i>	Southern Myotis	2.00 ha	Vulnerable	Not Listed

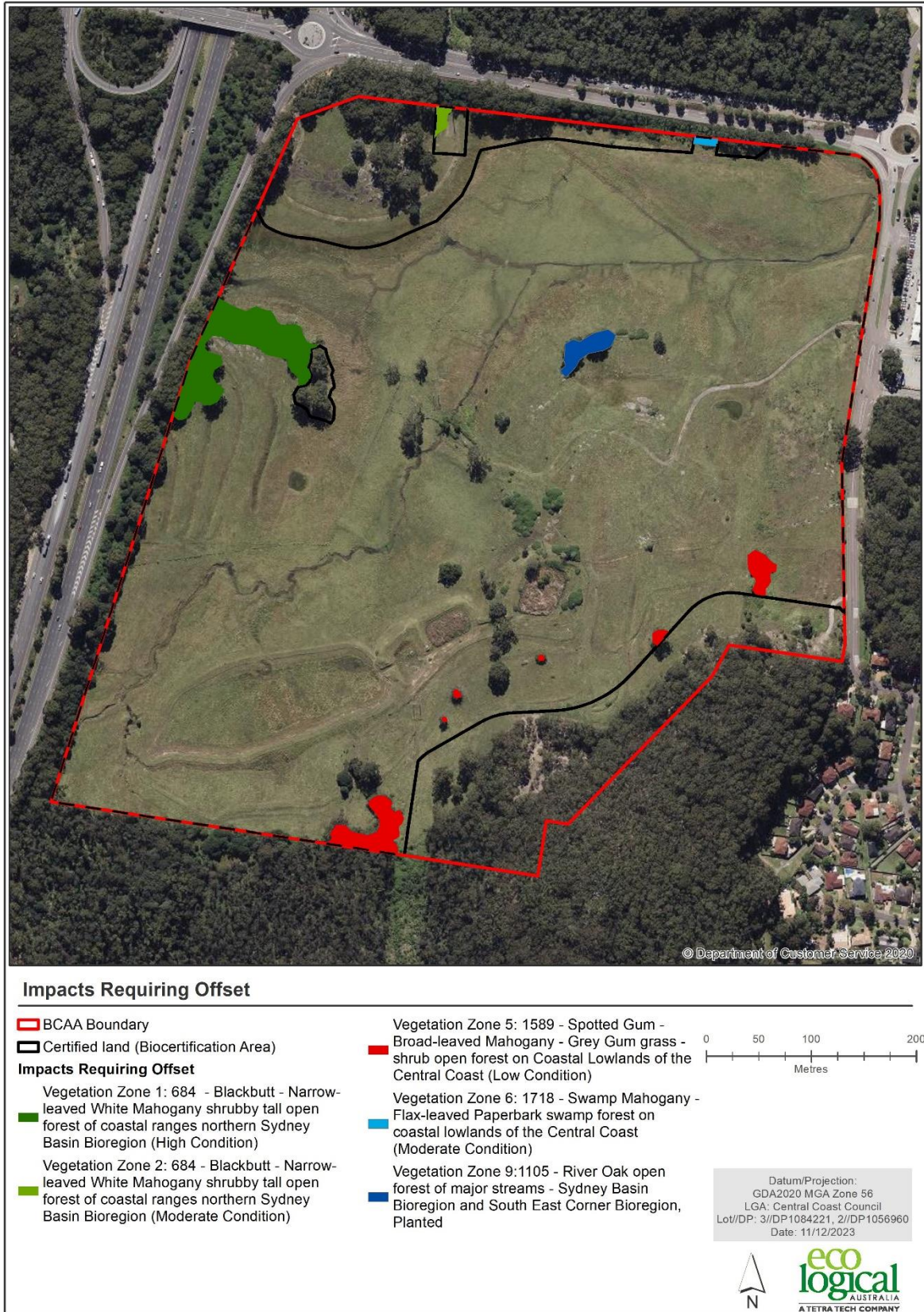
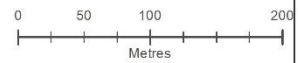


Figure 16: Impacts requiring offset



Melaleuca biconvexa Species Polygon Impact

- BCAA Boundary
- Certified land (Biocertification Area)
- Melaleuca biconvexa Associated PCT - Species Polygon**
- 1718 - Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast (Moderate Condition) (0.02 ha)
-



Datum/Projection:
 GDA2020 MGA Zone 56
 LGA: Central Coast Council
 Lot/DP: 3//DP1084221, 2//DP1056960
 Date: 11/12/2023



Figure 17: Impacts to *M. biconvexa* requiring offset

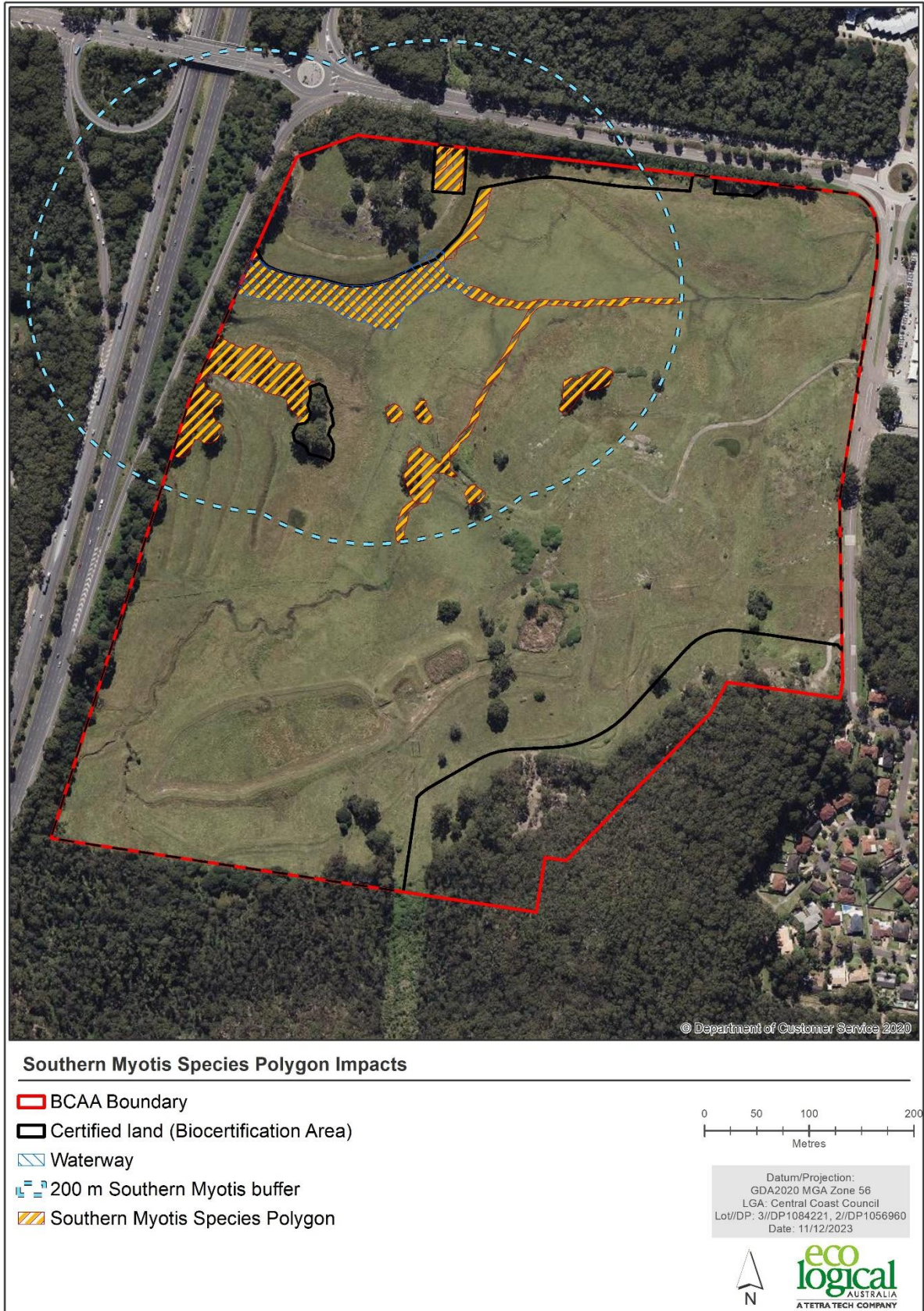


Figure 18: Impacts to *Myotis macropus* requiring offset

8.3. Impacts not requiring offsets

The impacts of the development not requiring offset is outlined in Table 35 and shown on Figure 19.

Table 35: Impacts to native vegetation that do not require offsets

Vegetation Zone	PCT ID	PCT Name	Direct impact (ha)	Rationale
VZ_3	684_Low	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	0.44	Vegetation integrity scores below threshold (VI Score: 4)
VZ_7	1718_Low	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	1.56	Vegetation integrity scores below threshold (VI Score: 12.8)
VZ_8	1720_Low	Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast	0.45	Vegetation integrity scores below threshold (VI Score: 12)

8.4. Areas not requiring assessment

Areas not requiring assessment are shown on Figure 20.

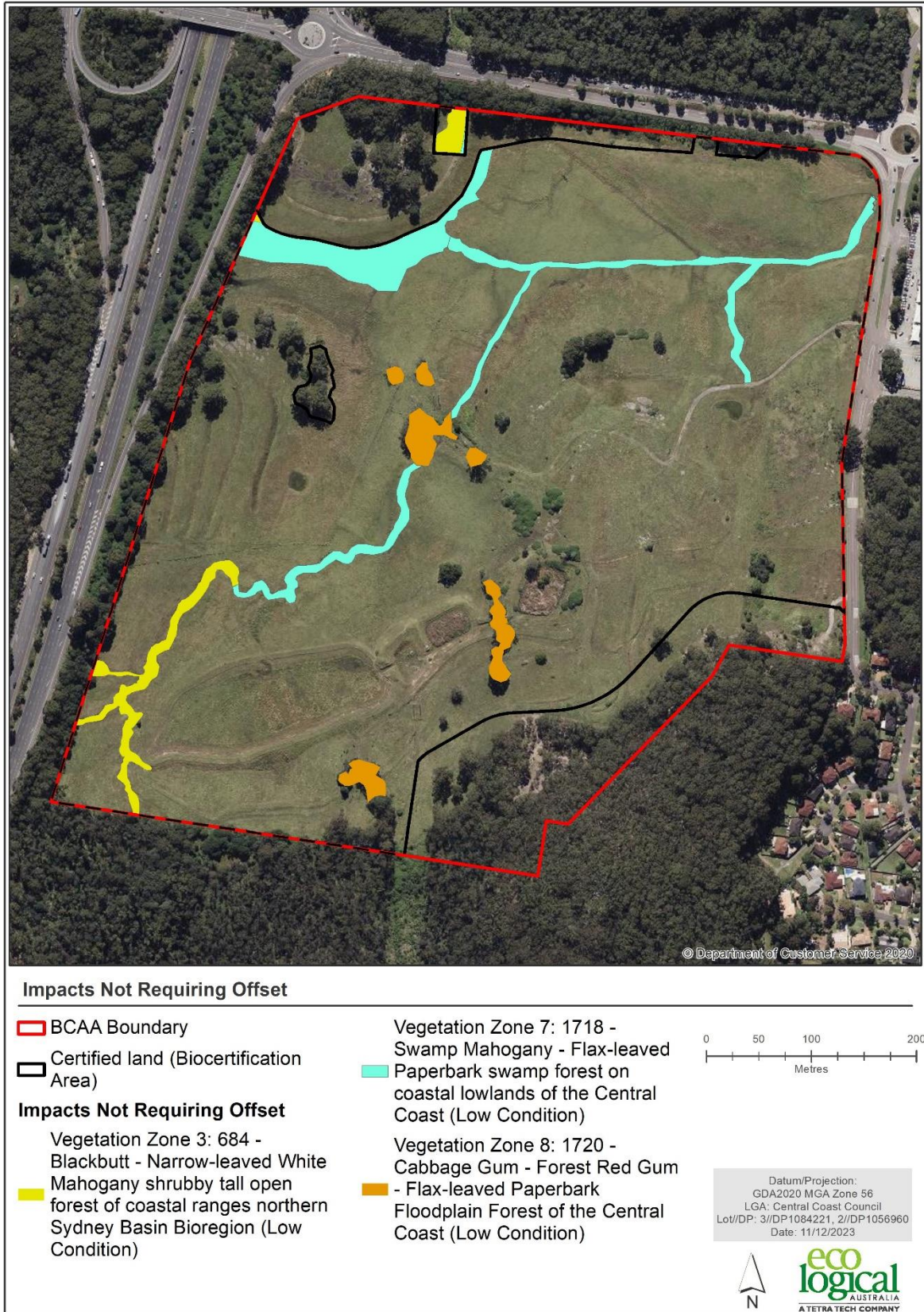


Figure 19: Impacts not requiring offset

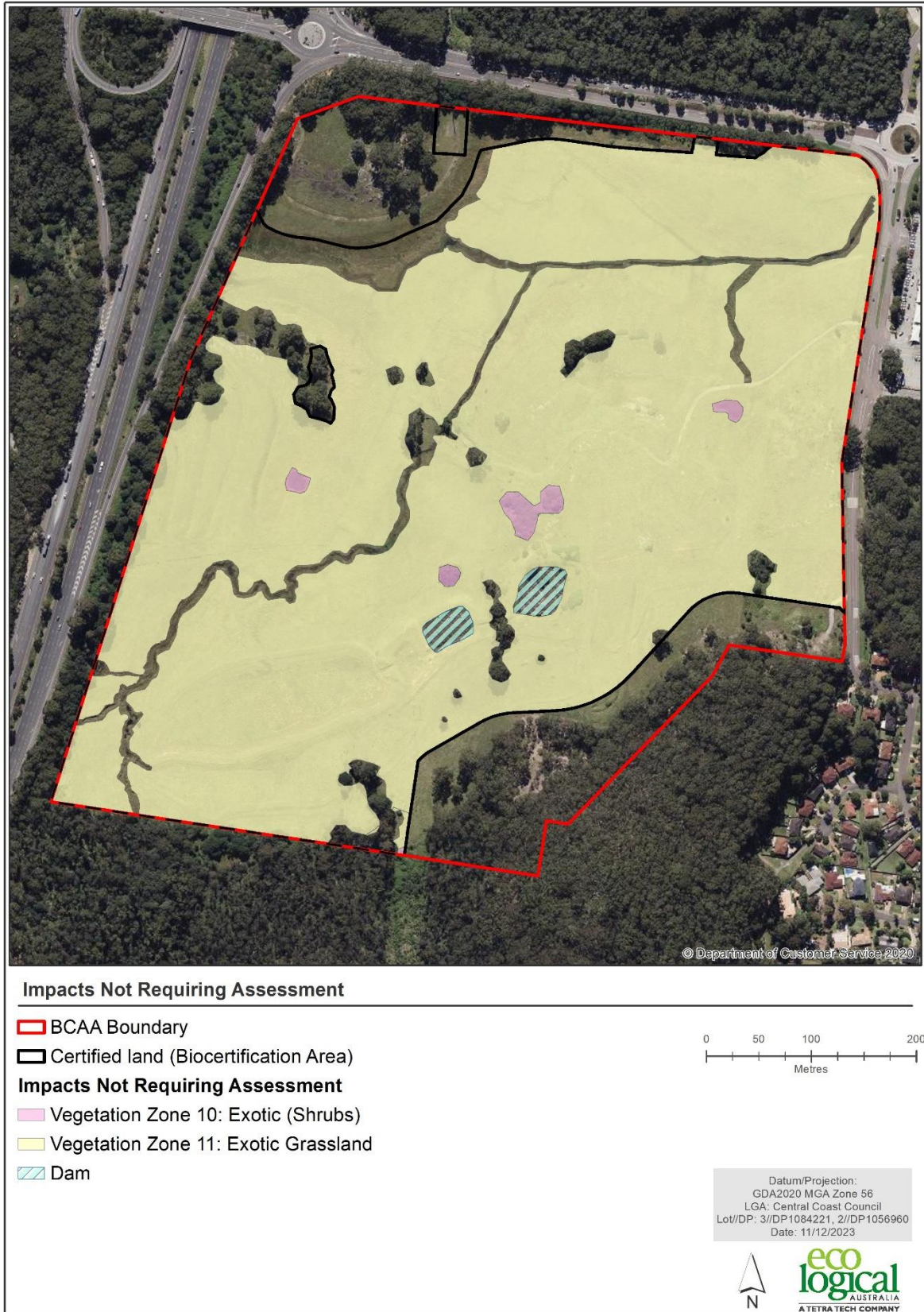


Figure 20: Areas not requiring assessment

8.5. Credit summary

The number of ecosystem credits required for the Biocertification area are outlined in Table 36 and the number of species credits required for the development are outlined in Table 37.

A biodiversity credit report is included in Appendix H.

Table 36: Ecosystem credits required

PCT ID	PCT Name	Vegetation Class	Vegetation Formation	Offset Trading Group	HBTs	Direct impact (ha)	Credits required
684	Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion	North Coast Wet Sclerophyll Forests	Wet Sclerophyll Forests (Shrubby sub-formation)	North Coast Wet Sclerophyll Forests - < 50% cleared group (including Tier 4 or higher threat status)	Yes	1.04	10
1105	River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion	Hunter-Macleay Sclerophyll Forests	Dry Forested Woodlands	Eastern Riverine Forests - < 50% cleared group (including Tier 4 or higher threat status)	Yes	0.09	2
1589	Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast	Coastal Swamp Forests	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Hunter-Macleay Dry Sclerophyll Forests - ≥ 70% - <90% cleared group (including Tier 2 or higher threat status)	No	0.28	4
1718	Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast	Coastal Wetlands	Floodplain Forested Wetlands	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	No	1.70	1

Table 37: Species credit summary

Species	Common Name	BC Act	EPBC Act	Direct impact -habitat (ha)	Credits required
<i>Melaleuca biconvexa</i>	Biconvex paperbark	Vulnerable	Vulnerable	0.02	1
<i>Myotis macropus</i>	Southern Myotis	Vulnerable	-	2.00	24

9. Proposed Biodiversity Certification Strategy

The following measures outlined in Table 38 are proposed to offset biodiversity impacts as per chapter 12 of the Biodiversity Assessment Method.

Table 38: Biodiversity offset measures proposed

Measures proposed	Description	Timing
a. credits proposed to be purchased or b. financial contributions proposed to be made to the Biodiversity Conservation Fund created) and retired	This BCAR has provided a credit requirement for the proposal. Ecosystem credit species are required for PCTs 689, 1589, 1718 and 1105 and species credits are required for <i>Melaleuca biconvexa</i> (Biconvex Paperbark) and <i>Myotis macropus</i> (Southern Myotis). A credit summary is provided in Table 36 and Table 37. The Proponent is proposing to either: <ul style="list-style-type: none"> • Purchase and retire biodiversity credits from the market; or • Discharge the credit obligation via payment into the Biodiversity Trust Fund. 	Credit purchase and retirement or payment into the fund will be made prior to commencement of works.
c. reservation of land under the NPW Act (declared strategic biodiversity certifications only)	Not applicable as this is not a strategic biodiversity certification.	n/a
d. adoption of development controls under the EP&A Act that conserve or enhance the natural environment (declared strategic biodiversity certifications only)	Not applicable as this is not a strategic biodiversity certification.	n/a
e. special infrastructure contributions that conserve or enhance the natural environment (declared strategic biodiversity certifications only)	Not applicable as this is not a strategic biodiversity certification.	n/a
f. any other measure determined to be an approved conservation measure by the Minister for Energy and Environment (declared strategic biodiversity certifications only).	Not applicable as this is not a strategic biodiversity certification.	n/a

In addition to the above, the following measures will also mitigate biodiversity impacts (Table 39).

Table 39: Measures proposed to mitigate biodiversity impacts

Measures proposed	Description	Timing
Vegetation Management Plan	A VMP with a minimum 5 year implementation period will be prepared and implemented for the 'land proposed for conservation measures' (see Figure 3).	VMP to be provided with the Development Application for the land adjoining the VMP area. Implementation of VMP to commence within 3 months of the commencement of physical works on site.
Section 88 Instrument, Conveyancing Act	A restrictive covenant under s88E will be applied to the VMP area which will restrict development within the area.	Within 1 year of commencement of the VMP

10. Consistency with legislation and policy

10.1. Environment Protection and Biodiversity Conservation Act 1999

Field survey identified several species listed as Matters of National Environmental Significance under the EPBC Act. These include:

- *Melaleuca biconvexa* (Biconvex paperbark)

A Significant Impact Criteria assessment under the EPBC Act has been completed for impacts associated with this listed Vulnerable species. This assessment can be found in Appendix F. From this assessment, an EPBC Act Referral to the Commonwealth Department of Agriculture, Water and the Environment for impacts on this species is not recommended.

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

Central Coast Council is listed as a local government area specified in Schedule 2 of State Environmental Planning Policy (SEPP) (Biodiversity and Conservation) 2021. Chapter 4 of the SEPP would apply to a development application, however does not apply to a Planning Proposal under Part 3 of the EP&A Act. Whilst this is the case, the following information is provided for completeness.

Vegetation within the BCAA is not considered to be highly suitable koala habitat for the purpose of this SEPP. The vegetation within the Biocertification area is highly fragmented and disturbed and has been historically cleared for agricultural purposes.

Step 1. Is the site potential Koala habitat?

Potential Koala Habitat is defined in SEPP (Koala Habitat Protection) 2020 as areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component. Two species of trees listed Under Schedule 2, being *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus robusta* (Swamp Mahogany) are present within the Biocertification area. The areas of PCTs comprising these two species within the Biocertification area are highly fragmented and disturbed, however, are considered likely to constitute at least 15% of the total number of trees in the upper or lower strata in these small patches.

Step 2. Is the site core Koala habitat?

Core Koala habitat is defined in SEPP (Koala Habitat Protection) 2020 as an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population.

Surveys conducted across the BCAA, including spotlighting, habitat assessments and remote cameras, failed to identify any individual Koalas or signs thereof. There is one Atlas record within 1km of the BCAA, recorded from 1968.

It is therefore concluded that the BCAA and Biocertification area does not contain core Koala habitat, and as such a Koala plan of management is not required.

11. References

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Appendix A Definitions

The following terminology has been used throughout this report for the purposes of describing the impacts of the proposal in the context of a biodiversity assessment in accordance with the NSW Biodiversity Assessment Method 2020. This terminology may or may not align with other technical documents associated with the proposed development.

Terminology	Definition
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site.
Biodiversity Certification Assessment Area	The Biodiversity Certification Assessment Area (BCAA) comprises the parcel of land assessed in this BCAR and comprises 'land proposed for Biodiversity Certification' and 'land subject to conservation measures'.
Biocertification Area	Land proposed for Biocertification. The Biocertification area is located within the wider Biodiversity Certification Assessment Area (BCAA).
BioNet Atlas	The BioNet Atlas (formerly known as the NSW Wildlife Atlas) is the OEH database of flora and fauna records. The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails) and some fish
Broad condition state:	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the vegetation integrity score.
Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
Credit Calculator	The computer program that provides decision support to assessors and Proponents by applying the BAM, and which calculates the number and class of biodiversity credits required to offset the impacts of a development or created at a biodiversity stewardship site.
Development	Has the same meaning as development at section 4 of the EP&A Act, or an activity in Part 5 of the EP&A Act. It also includes development as defined in section 115T of the EP&A Act.
Development footprint	The area of land that is directly impacted on by a proposed development, including access roads, and areas used to store construction materials.
Development site	An area of land that is subject to a proposed development that is under the EP&A Act.
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biodiversity stewardship site.
High threat exotic plant cover	Plant cover composed of vascular plants not native to Australia that if not controlled will invade and outcompete native plant species.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
Important wetland	A wetland that is listed in the Directory of Important Wetlands of Australia (DIWA) and SEPP 14 Coastal Wetlands

Terminology	Definition
Linear shaped development	Development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Local wetland	Any wetland that is not identified as an important wetland (refer to definition of Important wetland).
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Multiple fragmentation impact development	Developments such as wind farms and coal seam gas extraction that require multiple extraction points (wells) or turbines and a network of associated development including roads, tracks, gathering systems/flow lines, transmission lines.
Operational Manual	The Operational Manual published from time to time by DPIE, which is a guide to assist assessors when using the BAM.
Patch size	An area of intact native vegetation that: a) occurs on the development site or biodiversity stewardship site, and b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or stewardship site.
Proponent	A person who intends to apply for consent to carry out development or for approval for an activity.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height < 5 cm within a vegetation zone.
Residual impact	An impact on biodiversity values after all reasonable measures have been taken to avoid, minimise or mitigate the impacts of development. Under the BAM, an offset requirement is determined for the remaining impacts on biodiversity values.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site or a biodiversity stewardship site secured by a biodiversity stewardship agreement.
Riparian buffer	Riparian buffers applied to water bodies in accordance with the BAM.
Sensitive biodiversity values land map	Development within an area identified on the map requires assessment using the BAM.
Site attributes	The matters assessed to determine vegetation integrity. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site-based development	a development other than a linear shaped development, or a multiple fragmentation impact development.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection.

Terminology	Definition
Subject land	Is land to which the BAM is applied in Stage 1 to assess the biodiversity values of the land. 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.
Threatened Biodiversity Data Collection	Part of the BioNet database, published by DPIE and accessible from the BioNet website.
Threatened species	Critically Endangered, Endangered or Vulnerable threatened species as defined by Schedule 1 of the BC Act, or any additional threatened species listed under Part 13 of the EPBC Act as Critically Endangered, Endangered or Vulnerable.
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is published by OEH and is part of the BioNet Vegetation Classification.
Vegetation zone	A relatively homogenous area of native vegetation on a development site, land to be biodiversity certified or a biodiversity stewardship site that is the same PCT and broad condition state.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water.
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

Appendix B Vegetation Floristic Plot Data

Appendix C Vegetation Integrity Plot Data

Zone	Plot	PCT	Area	Condition	Composition									Structure					
					easting	northing	bearing	Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other
VZ_1	2	684	0.03	Mod	0	0	0	3	1	10	12	0	1	15.3	0.2	21.6	2.2	0.0	0.1
VZ_2	1	684	0.57	High	0	0	134	3	1	7	12	0	4	35.1	0.1	2.6	1.4	0.0	2.3
VZ_3	12	684	0.44	Low	0	0	0	1	0	13	12	3	0	0.1	0.0	49.0	1.4	0.3	0.0
VZ_3	13	684	0.44	Low	0	0	0	0	0	8	7	0	0	0.0	0.0	29.7	2.7	0.0	0.0
VZ_5	3	1589	0.28	Low	0	0	0	5	0	4	4	0	2	45.2	0.0	11.2	0.8	0.0	0.2
VZ_6	8	1718	0.14	Mod	0	0	0	4	0	3	4	0	1	18.2	0.0	4.1	0.4	0.0	2.0
VZ_7	6	1718	1.56	Low	0	0	96	0	0	9	8	0	0	0.0	0.0	64.7	13.9	0.0	0.0
VZ_8	7	1720	0.45	Low	0	0	0	1	0	0	0	0	0	15.0	0.0	0.0	0.0	0.0	0.0
VZ_9	10	1105	0.09	Planted	0	0	0	1	0	4	4	0	1	30.0	0.0	17.2	0.8	0.0	0.1

Zone	Plot	Functional											Regen	HTW
		Large Trees	HBTs	Litter	Fallen Logs	Stem 5to9	Stem 10to19	Stem20to29	Stem30to49	Stem50to79				
VZ_1	2	2	3	39	14	1	1	0	1	0	1	0	0	21.1
VZ_2	1	5	1	7	11	0	1	0	1	1	1	1	135.3	
VZ_3	12	0	0	1.6	1	0	0	0	0	0	0	0	37.7	
VZ_3	13	0	0	0.6	2	0	0	0	0	0	0	0	57.0	
VZ_5	3	1	0	16	13	0	0	1	1	1	0	0	63.0	
VZ_6	8	5	0	9.8	12	0	0	0	0	1	1	1	115.4	
VZ_7	6	0	0	0	0	0	0	0	0	0	0	0	15.0	
VZ_8	7	3	5	5	8	0	0	1	1	1	0	0	98.0	
VZ_9	10	8	0	12	24	0	1	1	1	1	0	0	86.1	

Note: Plot 9 and 11 consist of exotic grassland with majority comprising of *Axonopus fissifolius* (Crabgrass) and *Paspalum dilatatum* (Paspalum). Plot 4 and 5 completed within PCT 1589 (Moderate Condition) which is not being impacted within the 'Certified Land' (Biocertification Area). Data not entered into the BAMC, however, provided below.

Zone	Plot	PCT	Area	Condition	Composition									Structure					
					easting	northing	bearing	Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other
VZ_4	4	1589	1.65	Mod	351560.03	6313036.65	247	80.2	0.6	6.2	0.2	0.1	0.3	3	2	12	2	1	3
VZ_4	5	1589	1.65	Mod	351487.43	6313014.05	120	45.5	0.2	54.8	5.7	0.2	0.4	6	2	16	12	2	4
VZ_11	9	n/a	31.34	Exotic grassland	351815.05	6313291.15	260	0	0	39.8	0.8	0	0	0	0	8	4	0	0
VZ_11	11	n/a	31.34	Exotic grassland	351661.37	6313586.15	128	0	0	14.7	1.3	0	0	0	0	9	7	0	0

Zone	Plot	Functional											Regen	HTW
		Large Trees	HBTs	Litter	Fallen Logs	Stem 5to9	Stem 10to19	Stem20to29	Stem30to49	Stem50to79				
VZ_4	4	1	2	99.4	13	0	1	1	1	1	1	yes	0.1	
VZ_4	5	1	0	55	10	0	1	1	1	1	1	yes	80.3	
VZ_11	9	0	0	0.6	0	0	0	0	0	0	0	0	61	
VZ_11	11	0	0	0	0	0	0	0	0	0	0	0	68	

Appendix D PCT Profiles

PCT 684: Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion

Vegetation formation: Wet Sclerophyll Forests (Shrubby sub-formation)

Vegetation class: North Coast Wet Sclerophyll Forests

Vegetation structure: Forest/Woodland

Conservation status: BC Act: Not listed; EPBC Act: Not listed



(Moderate) condition



(High) condition

Tall eucalypt forest with a sparse mesic understorey. Usually occurring on Narrabeen Group sedimentary substrate and coastal lowlands and foothills mainly north from the Hawkesbury River to the Watagan Mountains.

Within the BCAA the canopy is dominated by *Eucalyptus pilularis* (Blackbutt); *Eucalyptus acmenoides* (White Mahogany) and *Syncarpia glomulifera* (Turpentine). The mid-stratum is characterised by *Breynia oblongifolia* (Coffee Bush), *Notelaea longifolia* (Mock Olive) and *Persoonia linearis* (Narrow-leaved Geebung). The ground cover contains *Dianella caerulea* and *Lomandra longifolia*.

A discussion of each of the condition zones is presented below.

Characteristic trees *Eucalyptus pilularis*; *Eucalyptus acmenoides*; *Syncarpia glomulifera*; *Eucalyptus paniculata* subsp. *paniculata*; *Angophora floribunda* and *Allocasuarina torulosa*

Characteristic midstorey *Breynia oblongifolia*; *Notelaea longifolia*; *Persoonia linearis* and *Synoum glandulosum*

Characteristic groundcovers *Dianella caerulea*; *Eustrephus latifolius*; *Lomandra longifolia*; *Pseuderanthemum variabile*; *Pteridium esculentum*; *Xanthorrhoea macronema* and *Imperata cylindrica* var. *major*

Condition zones present High - This zone is characterised by remnant canopy species with partly intact shrub and groundcover layer. Although it has suffered disturbance from past clearing, adjacent pastoral activities and common exotic species are present, it consists largely of native species and canopy regeneration is present.

Moderate - This zone has suffered from higher levels of past clearing and pastoral activities and is characterised by a sparse canopy layer with abundant exotic species within the shrub and ground layers. It occurs as isolated patches of canopy species with a ground layer dominated by common pastoral grass species.

Low - This zone has been highly modified from the original condition and lacks a canopy or mid-layer. The groundlayer comprises *Paspalum dilatatum* (Paspalum), *Axonopus fissifolius* (Crabgrass), however still comprises some native groundcovers such as *Dianella caerulea* var. *producta* (White flax-Lily), *Echinopogon caespitosus* var. *caespitosus* (Hedgehog grass) and *Microlaena stipoides* var. *stipoides* (Weeping grass).

PCT 684: Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion

This zone is characterised by remnant canopy species with partly intact shrub and groundcover layer. Although it has suffered disturbance from past clearing, adjacent pastoral activities and common exotic species are present, it consists largely of native species and canopy regeneration is present.

% remaining in NSW 58 %

Threats Weed invasion, clearing

1589: Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast

Vegetation formation: Dry Sclerophyll Forests (Shrub/grass sub-formation)

Vegetation class: Hunter-Macleay Dry Sclerophyll Forests

Vegetation structure: Forest/Woodland

Conservation status: BC Act: Not listed; EPBC Act: Not listed



(Mod-good) condition



(Low) condition

Open forest characterised by a canopy dominated by *Corymbia maculata* (Spotted Gum). The mid-storey ground layer is generally shrubby with various climbers and a range of grasses, graminoid and forbs. Occurs on coastal lowlands of the Central Coast mainly on sandstones.

Within the BCAA the canopy is dominated by *Corymbia maculata* (Spotted Gum) and *Eucalyptus umbra* (Broad-leaved White Mahogany). The mid-stratum is characterised by *Podolobium ilicifolium* (Prickly Shaggy Pea) and *Daviesia ulicifolia subsp. ulicifolia* (Gorse Bitter Peas) and the ground cover *Themeda australis* (Kangaroo grass); *Imperata cylindrica* (Blady Grass) and *Lomandra longifolia* (Spiny-headed Mat-rush).

A discussion of each of the condition zones is presented below.

Characteristic trees: *Corymbia maculata*; *Eucalyptus umbra* and *Eucalyptus punctata*.

Characteristic midstorey: *Daviesia ulicifolia*; *Pultenaea villosa*; *Breynia oblongifolia*; *Podolobium ilicifolium*; *Persoonia linearis*; *Notelaea longifolia* and *Pandorea pandorana*.

Characteristic groundcovers: *Themeda australis*; *Poa affinis*; *Joycea pallida*; *Imperata cylindrica*; *Lomandra confertifolia*; *Dianella caerulea*; *Lepidosperma neesii* and *Lomandra longifolia*.

Condition zones present: Moderate - Comprises moderate floristic diversity including remnant canopy species. 5% weeds present including *Lantana camara* (Lantana) and *Bidens pilosa var. pilosa* (Farmers Friend). Likely a result of human disturbance due to past clearing and adjacent pastoral activities.

Low - This zone is characterised by a remnant canopy with a degraded understorey structure, low floristic diversity and higher presence of exotic ground covers. 10-20% weeds present including *Ehrharta erecta* (Panic Veldtgrass); *Lantana camara* (Lantana) and *Paspalum dilatatum* (Paspalum). Likely a result of human disturbance due to past clearing and adjacent pastoral activities.

% remaining in NSW: 29 %

Threats: Weed invasion, clearing

1718: Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast

Vegetation formation: Forested Wetland

Vegetation class: Coastal Swamp Forests

Vegetation structure: Forest/Woodland

Conservation status: BC Act: 'Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions'
EPBC Act: Not listed



(Low) condition – form with canopy



(Low) condition – form without canopy

Myrtaceous Swamp Open Forests. Mid-stratum also myrtaceous and comprising small trees and tall shrubs. The ground stratum is made up of grasses and graminoid species with some ferns and forbs. Distributed from the southern boundary of NSW north to Karuah. It occurs typically on poorly drained unconsolidated sediments of the coastal lowlands at elevations typically under 50m.

Within the BCAA the canopy is dominated by *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus pilularis* (Blackbutt). The mid-stratum is characterised by *Glochidion ferdinandi* var *ferdinandi* (Cheese tree). The ground cover contains *Paspalum distichum* (Water Couch); *Microlaena stipoides* var. *stipoides* (Weeping grass); *Sacciolepis indica* (Indian Cup-scale Grass) and *Gratiola peruviana* (Australian Brooklime).

A discussion of each form and condition zones is presented below.

Characteristic trees: *Eucalyptus robusta*; *Angophora floribunda*;

Characteristic midstorey: *Melaleuca linariifolia*; *Glochidion ferdinandi*; *Callistemon salignus* and *Acacia longifolia*

Characteristic groundcovers: *Gahnia clarkei*; *Entolasia marginata*; *Lomandra longifolia*; *Imperata cylindrica*; *Viola hederacea*; *Dianella caerulea*; *Pteridium esculentum* and *Oplismenus imbecillis*;

Condition zones present: Moderate - This zone has a sparse remnant canopy with a degraded understorey, low floristic diversity and higher presence of exotic ground covers. 30-50% weeds are present including *Axonopus fissifolius* (Crabgrass); *Lantana camara* (Lantana) and *Paspalum dilatatum* (*Paspalum*). Likely a result of human disturbance due to past clearing and current grazing activities.

Low - The zone lacks a canopy layer and occurs within drainage lines with a higher diversity of semi-aquatic groundcover species. 10-20% weeds are present including *Isolepis prolifer*; *Myriophyllum aquaticum* (Brazilian Water-milfoil) and *Paspalum urvillei* (Vasey Grass). Likely a result of human disturbance due to past clearing and current grazing activities.

% remaining in NSW: 26 %

Threats: Weed invasion, clearing

1720: Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast

Vegetation formation: Forested Wetlands

Vegetation class: Coastal Floodplain Wetlands

Vegetation structure: Forest/Woodland

Conservation status: BC Act: EEC 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions'.
EPBC Act: CEEC 'River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions' (highly modified and does not meet condition thresholds under the EPBC Act for this patch)



(Low) condition

Myrtaceous Damp Open Forest. The canopy is dominated by *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus amplifolia* (Cabbage Gum). Mid-stratum is dense and is characterised by *Melaleucas*. The moderately dense ground stratum is composed of sedges and grasses. Occurs on poorly drained sites with unconsolidated sediments as a substrate. The main occurrences are in the Central Coast hinterlands at elevations under 30m.

Within the BCAA the canopy is dominated by *Eucalyptus amplifolia* (Cabbage Gum)

The mid-stratum is absent.

The ground cover contains *Microlaena stipoides* (Weeping grass) but mostly replaced by exotic pastoral species. A discussion of condition zones is presented below.

Characteristic trees: *Eucalyptus tereticornis* and *Eucalyptus amplifolia*.

Characteristic midstorey: *Melaleuca linariifolia* and *Melaleuca ericifolia*.

Characteristic groundcovers: *Carex appressa*; *Cynodon dactylon*; *Dichondra repens*; *Carex longibrachiata* and *Microlaena stipoides*.

Low - This zone is characterised by a remnant canopy with a degraded understorey structure, low floristic diversity and higher presence of exotic ground covers. 60-80% weeds present including *Axonopus fissifolius* (Crabgrass); *Lantana camara* (Lantana) and *Paspalum dilatatum* (Paspalum).

Likely a result of human disturbance due to clearing and current grazing activities.

% remaining in NSW: 10 %

Threats: Weed invasion, clearing

1105: River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion

Vegetation formation:	Forested Wetlands
Vegetation class:	Eastern Riverine Wetlands
Vegetation structure	Forest/Woodland
Conservation status:	BC Act: Not listed; EPBC Act: Not listed



The canopy is dominated by diagnostic species; *Casuarina cunninghamia* (River Oak). Canopy trees appear to have been planted in a row along a slight raised bank. The mid-layer comprises of *Lantana camara* (Lantana). Understory species are limited due to extensive grazing and clearing activities, comprising of exotic species such as *Ehrharta erecta* (Panic veldtgrass) and *Cynodon dactylon* (Couch grass). There is no indicative nearby occurrences of this community. The occurrence of this community is likely planted and not naturally occurring within the BCAA.

Characteristic trees	<i>Casuarina cunninghamia</i>
Characteristic midstorey	<i>Pandorea pandorana subsp. pandorana</i>
Characteristic groundcovers	No characteristic groundcover species present

Low - This zone comprises a canopy of *Casuarina cunninghamiana subsp. cunninghamiana* that appears to have been planted in a row along a slight raised bank. The mid-layer comprises *Lantana camara* (Lantana) with an exotic groundlayer of *Ehrharta erecta* (Panic veldtgrass) and *Cynodon dactylon* (Couch grass).

% remaining in NSW	60 %
Threats	Weed invasion, clearing

Appendix E EPBC Act Likelihood of Occurrence

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required	
FLORA									
<i>Acacia bynoeana</i>	Bynoe's Wattle	V	Heath or dry sclerophyll forest on sandy soils.	None	Yes	No	No	No-completed	Survey
<i>Angophora inopina</i>	Charmhaven Apple	V	Occurs most frequently in Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina woodland/forest, Hakea teretifolia–Banksia oblongifolia wet heath, Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina sedge woodland and Eucalyptus capitellata–Corymbia gummifera–Angophora inopina woodland/forest.	None	Yes	No	No	No-completed	Survey
<i>Asterolasia elegans</i>		E	Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys.	None	No	No	No	No-completed	Survey
<i>Baloskion longipes</i>	Dense Cord-rush	V	Swamps or depressions in sandy alluvium, swales within tall forest, and in Eucalyptus aggregata (Black Gum) Woodland.	None	Yes	No	No	No-completed	Survey

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Caladenia tessellata</i>	Thick Lip Spider Orchid	V	Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	Marginal	Yes	No	Potential	No-completed Survey
<i>Corunastylis insignis</i>	Wyong Midge Orchid 1, Variable Midge Orchid 1	CE	Grows in patches of Themeda australis (Kangaroo Grass) amongst shrubs and sedges in heathland, forest and woodland.	Marginal	Yes	No	Potential	No-completed Survey
<i>Cryptostylis hunteriana</i>	Leafless Tongue Orchid	V	margins of coastal swamps and sedgeland, coastal forest, dry woodland, and lowland forest.	Marginal	No	Yes	Potential	No-completed Survey
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	Dry rainforest; littoral rainforest; Leptospermum laevigatum-Banksia integrifolia subsp. integrifolia (Coastal Tea-tree– Coastal Banksia) coastal scrub; Eucalyptus tereticornis (Forest Red Gum) or Corymbia maculata (Spotted Gum) open forest and woodland; and Melaleuca armillaris (Bracelet Honey Myrtle) scrub.	Marginal	Yes	No	Potential	No-completed Survey
<i>Diuris bracteata</i>		Extinct	Sclerophyll woodland and forest with a predominantly grassy understorey.	Marginal	Yes	No	Potential	No-completed Survey

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Diuris praecox</i>	Rough Doubletail	V	Open forests.	Marginal	Yes	No	Potential	No-completed Survey
<i>Eucalyptus camfieldii</i>	Camfield's Stringybark	V	Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	None	Yes	No	No	No-completed Survey
<i>Eucalyptus glaucina</i>	Slaty Red Gum	V	Grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	None	No	No	No	No-completed Survey
<i>Eucalyptus parramattensis subsp. decadens</i>		V	Dry sclerophyll woodland, wet or dry heath on deep, low-nutrient sands, often subject to periodic inundation or where water tables are relatively high.	None	Yes	No	No	No-completed Survey
<i>Euphrasia arguta</i>		CE	Eucalypt forest with a mixed grass and shrub understorey, disturbed areas, along roadsides.	Marginal	Yes	No	Unlikely	No-completed Survey
<i>Genoplesium baueri</i>	Bauer's Orchid	Midge E	Dry sclerophyll forest and moss gardens over sandstone.	None	Yes	No	No	No-completed Survey
<i>Grevillea parviflora subsp. parviflora</i>	Small-flower Grevillea	V	Heath and shrubby woodland to open forest on sandy or light clay soils usually over thin shales.	Marginal	No	No	Unlikely	No-completed Survey

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Grevillea shiressii</i>		V	Creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils.	Marginal	Yes	No	Potential	No-completed Survey
<i>Macadamia integrifolia</i>	Macadamia Nut	V	Drier subtropical rainforest.	None	Yes	No	No	No-completed Survey
<i>Melaleuca biconvexa</i>	Biconvex Paperbark	V	Damp places, often near streams or low-lying areas on alluvial soils.	Good	Yes	Yes	Yes	Yes
<i>Melaleuca deanei</i>	Deane's Paperbark	V	Heath on sandstone.	Marginal	Yes	No	Potential	No-completed Survey
<i>Persicaria elatior</i>	Tall Knotweed	V	Beside streams and lakes, swamp forest or disturbed areas.	Marginal	Yes	No	Potential	No-completed Survey
<i>Persoonia hirsuta</i>	Hairy Geebung	E	Sandy soils in dry sclerophyll open forest, woodland and heath on sandstone.	None	Yes	No	No	No-completed Survey
<i>Pimelea curviflora</i> var. <i>curviflora</i>		V	Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	None	Yes	No	No	No-completed Survey
<i>Prostanthera askania</i>	Tranquility Mintbush	E	Moist sclerophyll forest and warm temperate rainforest on Narrabeen sandstone and derived alluvial soils.	None	Yes	No	No	No-completed Survey

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Prostanthera junonis</i>	Somersby Mintbush	E	Open forest, low woodland and open scrub on gently undulating country over weathered Hawkesbury sandstone.	None	Yes	No	No	No-completed Survey
<i>Rhizanthella slateri</i>	Rhizanthella slateri (Rupp) M.A. Clem. & Cribb in the Great Lakes local government area	E	Sclerophyll forest in shallow to deep loams.	None	Yes	No	No	No-completed Survey
<i>Rhizanthella slateri</i>	Eastern Australian Underground Orchid	E	Sclerophyll forest in shallow to deep loams.	None	Yes	No	No	No-completed Survey
<i>Rutidosia heterogama</i>	Heath Wrinklewort	V	Heath on sandy soils, moist areas in open forest, and along disturbed roadsides.	None	Yes	No	No	No-completed Survey
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	V	Subtropical and littoral rainforest on gravels, sands, silts and clays.	None	Yes	No	No	No-completed Survey
<i>Tetradlea juncea</i>	Black-eyed Susan	V	Low open forest/woodland, heathland and moist forest, mainly on low nutrient soils associated with the Awaba Soil Landscape.	Marginal	Yes	No	Potential	No-completed Survey

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Thelymitra adorata</i>	Wyong Sun Orchid	CE	From 10-40 m altitude in grassy woodland or derived grassland in well-drained clay loam or shale derived soils. Mostly in Spotted Gum - Ironbark Forest.	Marginal	Yes	No	Potential	No-completed Survey
<i>Thesium australe</i>	Austral Toadflax	V	Grassland on coastal headlands or grassland and grassy woodland away from the coast.	None	Yes	No	No	No-completed Survey
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<i>Actitis hypoleucos</i>	Common Sandpiper	M	Coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. Also estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	None	Yes	No	No	No
<i>Anthochaera phrygia</i>	Regent Honeyeater	CE	Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of <i>Casuarina cunninghamiana</i> (River Oak).	Marginal	Yes	No	Potential	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Apus pacificus</i>	Fork-tailed Swift	M	Riparian woodland., swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	Marginal	Yes	No	Potential	No
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E	Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	None	Yes	No	No	No
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M	Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	None	Yes	No	No	No
<i>Calidris melanotos</i>	Pectoral Sandpiper	M	Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	None	No	No	No	No
<i>Calidris ruficollis</i>	Red-necked Stint	M	Tidal mudflats, saltmarshes, sandy and shelly beaches, saline and freshwater wetlands, saltfields, sewage ponds.	None	No	No	No	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Chalinolobus dwyeri</i>	Large-eared Bat	Pied V	Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	Marginal	Yes	No	Potential	No
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Marginal	Yes	No	Potential	No
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spotted-tailed Quoll	E	Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	Marginal	Yes	No	Potential	No
<i>Gallinago hardwickii</i>	Latham's Snipe	M	Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	Marginal	Yes	No	Potential	No
<i>Grantiella picta</i>	Painted Honeyeater	V	Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	None	Yes	No	No	No
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	V	Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	None	Yes	No	No	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Hirundapus caudacutus</i>	White-throated Needletail	M	Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	Marginal	Yes	No	Potential	No
<i>Hoplocephalus bungaroides</i>	Broad-headed Snake	V	Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	None	Yes	No	No	No
<i>Lathamus discolor</i>	Swift Parrot	CE	Box-ironbark forests and woodlands.	Marginal	Yes	No	Potential	No
<i>Limosa lapponica</i>	Bar-tailed Godwit	M	Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	None	Yes	No	No	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Limosa limosa</i>	Black-tailed Godwit	M	Usually sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found around muddy lakes and swamps.	None	Yes	No	No	No
<i>Litoria aurea</i>	Green and Golden Bell Frog	V	Marshes, dams and stream-sides, particularly those containing <i>Typha</i> spp. (bullrushes) or <i>Eleocharis</i> spp. (spikerushes). Some populations occur in highly disturbed areas.	None	Yes	No	No	No
<i>Litoria littlejohni</i>	Littlejohn's Frog	Tree V	Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands	None	Yes	No	No	No
<i>Mixophyes balbus</i>	Stuttering Frog	V	Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	None	Yes	No	No	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Mixophyes iteratus</i>	Giant Barred Frog	E	Freshwater permanent/semi-permanent streams, generally at lower elevation. Riparian rainforest or wet sclerophyll forest is favoured.	Marginal	Yes	No	Potential	No
<i>Monarcha melanopsis</i>	Black-faced Monarch	M	Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	Marginal	Yes	No	Potential	No
<i>Motacilla flava</i>	Yellow Wagtail	M	Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	Marginal	Yes	No	Potential	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	M	Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.	None	Yes	No	No	No
<i>Numenius madagascariensis</i>	Eastern Curlew	CE, M	Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	None	Yes	No	No	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Numenius minutus</i>	Little Curlew	M	Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, saltfields, sewage ponds.	Marginal	Yes	No	Unlikely	No
<i>Numenius phaeopus</i>	Whimbrel	M	Estuaries, mangroves, tidal flats, coral cays, exposed reefs, flooded paddocks, sewage ponds, grasslands, sports fields, lawns.	Marginal	Yes	No	Unlikely	No
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	V	Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	None	Yes	No	No	No
<i>Phascolarctos cinereus</i>	Koala	V	Eucalypt woodlands and forests.	Marginal	Yes	No	Potential	No
<i>Pluvialis fulva</i>	Pacific Plover	Golden M	Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	Marginal	Yes	No	Unlikely	No
<i>Pluvialis squatarola</i>	Grey Plover	M	Mudflats, saltmarsh, tidal reefs and estuaries.	None	Yes	No	No	No
<i>Potorous tridactylus</i>	Long-nosed Potoroo	V	Coastal heaths and dry and wet sclerophyll forests.	None	Yes	No	No	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	V	Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	None	Yes	No	No	No
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V	Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Marginal	Yes	No	Potential	No
<i>Rhipidura rufifrons</i>	Rufous Fantail	M	Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	None	Yes	No	No	No
<i>Rostratula australis</i>	Australian Painted Snipe	E	Swamps, dams and nearby marshy areas.	Marginal	Yes	No	Potential	No
<i>Tringa brevipes</i>	Grey-tailed Tattler	M	Sheltered coasts with reefs and rock platforms or intertidal mudflats; intertidal rocky, coral or stony reefs; shores of rock, shingle, gravel or shells; embayments, estuaries and coastal lagoons; lagoons and lakes; and ponds in sewage farms and saltworks.	Marginal	Yes	No	Unlikely	No

Scientific Name	Common Name	EPBC Act Status	Habitat	Habitat quality present (good, marginal, none)	Species known to occur in region	Species known to occur on site	Likelihood of occurrence	Impact Assessment Required
<i>Tringa nebularia</i>	Common Greenshank	M	Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	Marginal	Yes	No	Unlikely	No
<i>Tringa stagnatilis</i>	Marsh Sandpiper	M	Swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, intertidal mudflats, sewage farms and saltworks, reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	Marginal	Yes	No	Unlikely	No

Appendix F Significant Impact Criteria Assessment

This appendix provides an assessment of the significance of potential impacts from the proposed activity on MNES. The EPBC Act Administrative Guidelines on Significance set out ‘Significant Impact Criteria’ that are to be used to assist in determining whether a proposed action is likely to have a significant impact on matters of national environmental significance.

An action will require federal approval if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- extinct in the wild
- critically endangered
- endangered
- vulnerable
- migratory

Vulnerable species

- *Melaleuca biconvexa* (Biconvex Paperbark)

M. biconvexa occurs as disjunct populations in coastal New South Wales from Jervis Bay to Port Macquarie, but the main concentration of records is in the Gosford/Wyong area. Within the Gosford/Wyong area most populations occur on private land or on road reserves. The species may occur in dense stands forming a narrow strip adjacent to watercourses, in association with other *Melaleuca* species or as an understorey species in wet forest (DPE 2019).

a) Lead to a long-term decrease in the size of an important population of a species

The proposed activity could lead to a long-term decrease in the size of an important population of *Melaleuca biconvexa* if it significantly reduced or degraded habitat available to the species. Approximately 30 stems were recorded in 2010, and these numbers were confirmed by ELA in April 2021. Through detailed avoid and minimise, no individuals of *M. biconvexa* will be impacted. An Atlas search of a 10 km x 10 km radius of the BCAA identified approximately 752 individuals. The 30 stems recorded in this one locality will not be impacted, additionally further avoidance of suitable habitat (by 86%) has occurred. Based on this detailed avoid and minimise, 0.02 ha of suitable habitat for *M. biconvexa* will be impacted. It is not considered that this small area would be necessary for maintaining genetic diversity within the wider population or lead to a long-term decrease in the size of an important population of the species.

b) Reduce the area of occupancy of an important population

The individuals present within the Biocertification area do not form part of an important population. Individuals will not be impacted, therefore, the proposed development will not reduce the area of occupancy of an important population.

c) Fragment an existing important population into two or more populations

The individuals present within the Biocertification area do not form part of an important population. Individuals will not be impacted, therefore, the proposed development will not fragment an existing important population into two or more populations.

d) Adversely affect habitat critical to the survival of a species

Habitat that is critical to the survival of a species includes habitat utilised for the long-term maintenance of the species and to maintain genetic diversity and long-term evolutionary development. The proposed removal of vegetation, comprising 0.02 ha of suitable habitat is not considered habitat critical to the survival of this species. The presence of over 750 records of *M. biconvexa* within a 10 km radius indicates that this species persists well outside this small area of habitat.

e) Disrupt the breeding cycle of an important population

The individuals present within the Biocertification area do not form part of an important population; therefore, the proposed development will not disrupt the breeding cycle of an important population.

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

The proposed activity will result in the removal of 0.02 ha of suitable habitat of *M. biconvexa*.

The amount of habitat directly removed is unlikely to be on the scale that would result in a decline of the species, therefore, it is unlikely that the proposed activity will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

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

Invasive species which out-competes native species for space and resources that are harmful to *M. biconvexa* already exist in the locality, with exotic species present throughout the site.

The proposed activity is unlikely to exacerbate the impacts of invasive species or lead to increased mortality for this species.

h) Introduce disease that may cause the species to decline, or

It is unlikely that the proposed works will introduce disease that may cause the species to decline.

i) Interfere substantially with the recovery of the species

In consideration of the above factors, the proposed activity is unlikely to substantially interfere with the recovery of the species.

Conclusion

The habitat within the Biocertification area forms a small amount (0.02 ha) of habitat available to this species, therefore the proposed activity is not considered likely to have a significant impact on the species. EPBC Act Referral to the Commonwealth Department of Agriculture, Water and the Environment for impacts on this species is not recommended.

Appendix G Ecosystem species report.

Common Name	Scientific Name	Vegetation Types(s)	Habitat Constraints	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Australasian Bittern	<i>Botaurus poiciloptilus</i>	1105	Waterbodies; Brackish or freshwater wetlands	Moderate Sensitivity	Endangered	Endangered
Barking Owl	<i>Ninox connivens</i>	684, 1589, 1718, 1720, 1105	NA	High Sensitivity	Vulnerable	Not Listed
Black Bittern	<i>Ixobrychus flavicollis</i>	1718, 1720, 1105	Waterbodies; Land within 40 m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation	Moderate Sensitivity	Vulnerable	Not Listed
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	1589, 1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
Broad-headed Snake	<i>Hoplocephalus bungaroides</i>	684, 1105	N/A	High Sensitivity	Endangered	Vulnerable
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	1589, 1105	NA	High Sensitivity	Vulnerable	Not Listed
Diamond Firetail	<i>Stagonopleura guttata</i>	1589, 1105	NA	Moderate Sensitivity	Vulnerable	Not Listed
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	684, 1105	NA	Moderate Sensitivity	Vulnerable	Not Listed
Eastern Chestnut Mouse	<i>Pseudomys gracilicaudatus</i>	684, 1718	NA	High Sensitivity	Vulnerable	Not Listed
Eastern Coastal Free-tailed Bat	<i>Micronomus norfolkensis</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Not Listed

Common Name	Scientific Name	Vegetation Types(s)	Habitat Constraints	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Eastern Osprey	<i>Pandion cristatus</i>	1718, 1720, 1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
Flame Robin	<i>Petroica phoenicea</i>	1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	684, 1589, 1105	N/A	Moderate Sensitivity	Vulnerable	Endangered
Glossy Black- Cockatoo	<i>Calyptorhynchus lathami</i>	684, 1589, 1105	Other; Presence of Allocasuarina and casuarina species	High Sensitivity	Vulnerable	Not Listed
Golden-tipped Bat	<i>Phoniscus papuensis</i>	684, 1589, 1718	N/A	High Sensitivity	Vulnerable	Not Listed
Greater Broad-nosed Bat	<i>Scoteanax rueppellii</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	1589, 1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
Grey-headed Flying- fox	<i>Pteropus poliocephalus</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Vulnerable
Koala	<i>Phascolarctos cinereus</i>	684, 1589, 1718, 1105	Presence of koala use trees	High Sensitivity	Endangered	Endangered
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Little Bent-winged Bat	<i>Miniopterus australis</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Little Eagle	<i>Hieraetus morphnoides</i>	684, 1589, 1718, 1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
Little Lorikeet	<i>Glossopsitta pusilla</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Not Listed

Common Name	Scientific Name	Vegetation Types(s)	Habitat Constraints	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Masked Owl	<i>Tyto novaehollandiae</i>	684, 1589, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
New Holland Mouse	<i>Pseudomys novaehollandiae</i>	684	N/A	High Sensitivity	Not Listed	Vulnerable
Painted Honeyeater	<i>Grantiella picta</i>	1589, 1105	Other;Mistletoes present at a density of greater than five mistletoes per hectare	Moderate Sensitivity	Vulnerable	Vulnerable
Powerful Owl	<i>Ninox strenua</i>	684, 1589, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Regent Honeyeater	<i>Anthochaera phrygia</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Critically Endangered	Critically Endangered
Rosenberg's Goanna	<i>Varanus rosenbergi</i>	684, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Scarlet Robin	<i>Petroica boodang</i>	1589, 1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
Speckled Warbler	<i>Chthonicola sagittata</i>	1589, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Spotted Harrier	<i>Circus assimilis</i>	1105				
	N/A	Moderate Sensitivity	Vulnerable	Not Listed		
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	684, 1589, 1718, 1720, 1105	N/A	High Sensitivity	Vulnerable	Endangered
Square-tailed Kite	<i>Lophoictinia isura</i>	684, 1589, 1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
Swift Parrot	<i>Lathamus discolor</i>	684, 1589, 1718, 1105	N/A	Moderate Sensitivity	Endangered	Critically Endangered

Common Name	Scientific Name	Vegetation Types(s)	Habitat Constraints	Sensitivity to gain class	BC Act listing status	EPBC Act Listing status
Turquoise Parrot	<i>Neophema pulchella</i>	1589, 1105	N/A	High Sensitivity	Vulnerable	Not Listed
Varied Sittella	<i>Daphoenositta chrysoptera</i>	684, 1589, 1718, 1720, 1105	N/A	Moderate Sensitivity	Vulnerable	Not Listed
White-bellied Sea- Eagle	<i>Haliaeetus leucogaster</i>	1589, 1718, 1720, 1105	N/A Waterbodies; Within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines	High Sensitivity	Vulnerable	Not Listed
White-throated Needletail	<i>Hirundapus caudacutus</i>	684, 1589, 1718, 1720, 1105	N/A	High Sensitivity	Not Listed	Vulnerable
Yellow-bellied Glider	<i>Petaurus australis</i>	684, 1589	Hollow bearing trees; Hollows > 25cm diameter	High Sensitivity	Vulnerable	Vulnerable
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	684, 1589, 1718, 1105	N/A	High Sensitivity	Vulnerable	Not Listed

Appendix H Biodiversity credit report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00025311/BAAS17101/21/00025312	Tuggerah Gateway	22/06/2023
Assessor Name	Report Created	BAM Data version *
Lily Gorrell	08/11/2023	61
Assessor Number	BAM Case Status	Date Finalised
BAAS17101	Finalised	08/11/2023
Assessment Revision	Assessment Type	
5	Biocertification	

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAI	Ecosystem credits
Blackbutt - Narrow-leaved White Mahogany shrubby tall open forest of coastal ranges, northern Sydney Basin Bioregion												
1	684_VZ2_Moderate	Not a TEC	28.1	28.1	0.03	PCT Cleared - 42%	High Sensitivity to Gain			1.50		1

2	684_VZ1_High	Not a TEC	41.7	41.7	0.57	PCT Cleared - 42%	High Sensitivity to Gain			1.50		9
3	684_VZ3_Low	Not a TEC	4	4.0	0.44	PCT Cleared - 42%	High Sensitivity to Gain			1.50		0
										Subtotal	10	
Cabbage Gum - Forest Red Gum - Flax-leaved Paperbark Floodplain Forest of the Central Coast												
7	1720_VZ8_Low	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	12	12.0	0.45	PCT Cleared - 90%	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		0
										Subtotal	0	
River Oak open forest of major streams, Sydney Basin Bioregion and South East Corner Bioregion												
8	1105_VZ9_Planted	Not a TEC	49.8	49.8	0.09	PCT Cleared - 40%	High Sensitivity to Gain			1.50		2
										Subtotal	2	

Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast												
4	1589_VZ5_ Low	Not a TEC	29.2	29.2	0.28	PCT Cleared - 71%	High Sensitivity to Gain			2.00		4
										Subtotal	4	
Swamp Mahogany - Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast												
5	1718_VZ6_ Moderate	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	36.6	36.6	0.02	PCT Cleared - 74%	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		1

6	1718_VZ7_Low	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	12.8	12.8	1.6	PCT Cleared - 74%	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		0
										Subtotal	1	
										Total	17	

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAIL	Species credits	
Melaleuca biconvexa / Biconvex Paperbark (Flora)										
1718_VZ6_Moderate		36.6	36.6	0.02		Vulnerable	Vulnerable	False	1	
									Subtotal	1
Myotis macropus / Southern Myotis (Fauna)										
684_VZ2_Moderate		28.1	28.1	0.03		Vulnerable	Not Listed	False	1	
684_VZ1_High		41.7	41.7	0.56		Vulnerable	Not Listed	False	12	

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684_VZ3_Low	4.0	4.0	0.09		Vulnerable	Not Listed	False	1
1718_VZ7_Low	12.8	12.8	1.1		Vulnerable	Not Listed	False	7
1720_VZ8_Low	12.0	12.0	0.22		Vulnerable	Not Listed	False	1
1105_VZ9_Planted	49.8	49.8	0.09		Vulnerable	Not Listed	False	2
							Subtotal	24

