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Biodiversity Development Assessment Report

Residential Subdivision and Associated Infrastructure

Lot 23 Boomerang Drive, Blueys Beach NSW

Prepared for: Addenbrooke Pty Ltd

31 August 2022

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Document Control

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EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by Addenbrooke Pty Ltd (the proponent) to undertake a Biodiversity Development Assessment Report (BDAR) for a proposed residential subdivision development consisting of 73 lots, approx. 2400m^2 of commercial space, associated access roads and associated infrastructure (the Subject Site) within Lot 23, located at Boomerang Drive, Blueys Beach NSW in the MidCoast Local Government Area.

This report has been prepared to meet the requirements of the *Biodiversity Assessment Method 2020* (BAM) established under Section 6.7 of the *Biodiversity Conservation Act 2016* (NSW). This assessment utilises methods detailed within the BAM Order 2020 to identify biodiversity values inherent within the site, including known and potentially occurring threatened species and ecological communities, and quantifies impacts of the proposal upon these values.

The Subject Site is zoned C4 – Environmental Living, B1 – Neighbourhood Centre and R2 – Low Density Residential, and covers approximately 8.88ha and contains six (6) plant community types (PCTs) in different stages of disturbance, as well as farm dams and non-native vegetation / grazed paddocks (6.7ha). The PCTs identified are:

- PCT 1235 - *Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion,* commensurate with EEC *Swamp Sclerophyll Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions*;
- PCT 1525 - *Sandpaper Fig - Whalebone Tree warm temperate rainforest*, commensurate with EEC *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregions*;
- PCT 1262 - *Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast*;
- PCT 1537 - *Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast*, commensurate with EEC *Littoral Rainforest in NSW North Coast, Sydney Basin and South East Corner Bioregions*;
- PCT 1556 - *Tallowwood – Smooth-barked Apple – Blackbutt grass tall open forest of the Central and lower North Coast*, commensurate with EEC *River-flat Eucalypt Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions*; and
- PCT 1737 - *Typha rushland*, commensurate with EEC *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*.

One (1) additional PCT is present within the greater Study Area, based upon Rapid Data Point surveys (RDPs). This is:

- PCT 1215 – *Spotted Gum – Grey Ironbark open forest of the Macleay Valley lowlands of the NSW North Coast Bioregion*, commensurate with EEC *Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion*.

An assessment of Key Diagnostic Characteristics for the EPBC-listed Critically Endangered Ecological Community *River-flat Eucalypt Forest on coastal floodplains of Southern NSW and eastern Victoria* was undertaken as outlined in Section 5.1.1 of the Department of Agriculture, Water and Environments (2020) Conservation Advice for this community. The assessment is presented in **Appendix J**. PCT 1556 is not commensurate with this CEEC.

Fauna species recorded were typical of those expected in this locality and in this type of remnant habitat with existing connection to larger patches of habitat offsite. The surveys also resulted in a number of other threatened species foraging or potentially foraging within the Subject Site. With no available breeding habitat, these species will be incorporated into Ecosystem Credits. These species include: Grey-headed Flying Fox (*Pteropus poliocephalus*), White-bellied Sea Eagle (*Haliaeetus leucogaster*), Little Bent-winged Bat (*Miniopterus australis*), Large Bent-Winged Bat (*Miniopterus orianae oceanensis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*), Southern Myotis (*Myotis macropus*), and Eastern Cave Bat (*Vespadelus troughtoni*).

To offset residual impacts of the proposal upon identified biodiversity values, the proposal would require a total of 51 Ecosystem Credits. The following Species Credits also apply to the proposal:

- *Rhodamnia rubescens* - 3 credits.

Avoid and minimise has been considered through development placement, retention of particular areas of vegetation and habitat, and the creation of a Vegetation Management Plan (VMP) (to improve and maintain retained vegetation within impact area), as well as investigations into the creation of a Biodiversity Stewardship Site over the remainder of Lot 23. Remaining impacts are proposed to be offset.

Assessment of the proposal under other relevant environmental policy instruments including *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP), *State Environmental Planning Policy (Resilience and Hazards) 2021 (*Resilience and Hazards SEPP) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was undertaken. The development only provides potential seasonal foraging habitat for relevant species, the Subject Site is not mapped as Important Areas for Regent Honeyeater, Swift Parrot or Migratory Shorebirds, and no Grey-headed Flying-fox roost camp is present within the site. Therefore, referral under the Environment Protection and Biodiversity Conservation Act is not likely to be necessary for this development.

Based on the assessments undertaken, the proposed development has sought to avoid and minimise impacts as far as practicable, and seeks offsets where not possible. In addition, it is further proposed that the remainder of the site be retained and managed under a Biodiversity Stewardship Site. Investigations into this area and development of a Biodiversity Stewardship Site Assessment Report (BSSAR) are already underway.

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Study Certification and Licensing

This report was written by Frances O'Brien BEnv LLB GDLP MEL (BAAS: 20013), reviewed by Craig Anderson (BAAS: 17002) and certified by Frances O'Brien of Anderson Environment & Planning.

Staff	Title/Qualification	Tasks
Craig Anderson	Director BAppSc (Env A&M)	Targeted field surveys – flora and fauna, habitat assessment; report review
Frances O'Brien	Senior Ecologist (Lead Botanist) BEnv LLB GDLP MEL BAAS: 20013	Targeted field surveys – flora and fauna; PCT determination; GIS; report author
Dennis Neader	Senior Ecologist BSc (Env Geo)	Targeted field surveys – flora and fauna; habitat assessment
Warwick Muir	Ecologist BSc (Biology)	Targeted field surveys – flora and fauna; habitat assessment; equipment deployment
Stevie Kay	Ecologist BSc	Targeted field surveys – flora and fauna; habitat assessment
Darcy Kilvert	Ecologist BSc (Biology)	Targeted field surveys – flora and fauna; habitat assessment
Thomas Stephens	Ecologist BEnvSc & Mgt (Sustainability)	Targeted flora surveys
Oscar Anderson	Junior Ecologist BEnvSc & Mgt (Environmental Science) (2023)	Targeted flora surveys

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101313;
- Animal Research Authority (Trim File No: 14/600(2)) issued by NSW Agriculture; and
- Animal Research Establishment Accreditation Number 53724.

Certification:

As the principal author, I, Frances O'Brien, make the following certification:

- This report has been written to comply with the requirements of the BAM 2020 and obligations outlined within the BAM Assessor Code of Conduct and includes, in the opinion of the writer, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area, and inferences of such for biodiversity credit calculations;
- BAM Assessment methodology, as well as Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons;
- All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the *Animal Research Act 1995*, *National Parks and Wildlife Act 1974* and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Principal Author and Certifier:

Frances O'Brien
Senior Ecologist (Lead Botanist)
Anderson Environment & Planning
BAAS no. 20013
Calculator Ref: 00030047/BAAS19076/21/00030048

31 August 2022

Glossary of Terms

APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method Order (2020) that determines: • Method applicable to quantifying biodiversity values inherent within a development site; • Avoid and minimise efforts required to be employed as part of any development proposal; and • Number and class of credits required to offset residual impacts of the proposal upon the biodiversity values therein.
BC Act	Biodiversity Conservation Act 2016
Biodiversity Credit Report	Specifies the number and type of biodiversity credits required to offset the impacts of a development.
BAM Calculator (BAM-C)	Online tool used to interpret site survey data and regional location information to quantify ecosystem and species credits required / generated at a development / stewardship site.
Biodiversity credits	Ecosystem or Species Credits required to offset the loss of biodiversity values on a development site.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values.
Biodiversity values	Composition, structure and function of ecosystems, and threatened species, populations and ecological communities, and their habitats.
Council	MidCoast Council
Development Lands	Land upon which the development is proposed, and within which impacts upon biodiversity are required to be offset. Majority of the Development lands are zoned R2 – Low Density Residential.
DAWE	Former Commonwealth Department of Agriculture, Water and Environment, now DCCEEW
DCCEEW	Commonwealth Department of Climate Change, Environment, Energy and Water
DoEE	Former Commonwealth Department of the Environment and Energy, now DCCEEW
DPE	NSW Department of Planning and Environment
DPI	Former NSW Department of Primary Industries
DPIE	Former NSW Department of Planning, Industry and Environment, now DPE
Ecosystem credit	Class of biodiversity credits created or required for the impact on EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur within a vegetation type.
EEC	Endangered Ecological Community (under BC Act).
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
OEH	Former NSW Office of Environment and Heritage, now DPE
PFC	Percentage Foliage Cover
Study Area	Lot 23 DP 537919
Subject Site	Part Lot 23 DP 537919 as shown in Figures 1, 2 and 3
Species credit	Class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area based on habitat surrogates.
TBDC	Threatened Biodiversity Data Collection

TEC	Threatened Ecological Community

1.0 Stage 1 – Biodiversity Assessment

1.1 Introduction

A residential subdivision is proposed within land known as Lot 23 Boomerang Drive, Blueys Beach NSW. At the request of Addenbrooke Pty Ltd (the proponent), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of a Biodiversity Development Assessment Report (BDAR) addressing a proposed residential subdivision and associated ancillary development.

This BDAR undertaken adheres to the approach outlined in the Biodiversity Assessment Method (DPIE 2020) (the BAM) and the BAM Calculator User Guide (OEH 2018).

1.1.1 Biodiversity Offset Scheme Threshold Trigger

This BDAR has been triggered as required by Clause 7.1 *Biodiversity Conservation Regulation 2017* by the following:

- (1) (a) the clearing of native vegetation of an area declared by clause 7.2 as exceeding the threshold

The minimum lot size for the Subject Site is 450m^2. The clearing threshold for minimum lot sizes less than 1 ha is 0.25ha or more. As 2.66ha of native vegetation is proposed for clearance, the proposed development will require entry into the Biodiversity Offset Scheme.

1.1.2 Biodiversity Mapped Land

The Biodiversity Values Map (BV Map) tool identifies land with high biodiversity value, as defined by the Biodiversity Conservation Act Regulations (BCR). The Biodiversity Offsets Scheme (BOS) applies to all local developments, major projects or the clearing of native vegetation where the State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017 applies. Any of these will require entry into the BOS if they occur on land mapped on the Biodiversity Values Map (refer **Appendix K**). Exempt and complying development or private native forestry are not subject to the BOS. The BOSET report does include BV mapped land mapped as *Biodiversity Values "mapped for more than 90 days"* nor *"added within the last 90 days"* within or adjacent to the Subject Site.

BV mapped land is not present in the Subject Site. BV mapped land is present to the northwest of the Subject Site, mapped for the reasons of 'Coastal Management SEPP – Littoral Rainforest' and 'Identified Rainforest'.

1.1.3 Assessment Scope and Method

The BDAR presented herewith aims to quantify impacts of the proposal upon biodiversity values based upon the methods described within the *Biodiversity Assessment Method Order 2020* (BAM Order), including threatened entities listed under the NSW *Biodiversity Conservation Act 2016* (BC Act).

Site layout allowed for the landscape values to be determined based upon a site-based method, rather than a linear method.

This report includes:

- **Stage 1 – Biodiversity Assessment** – including the mapping of remnant vegetation communities including Endangered Ecological Communities (EECs) within the site, the location of previously identified threatened species and their habitats, and potential contemporary occurrence of threatened species identified within the BAM Calculator; and
- **Stage 2 – Impact Assessment** – identification of impact avoidance and mitigation measures, and the quantifying of offset requirements in the form of biodiversity credits based upon residual impacts of the proposal.

1.1.4 The Proposal

The proposed development involves land subdivision for residential lots and associated infrastructure and would require the clearance of approx. 2.66ha of native vegetation. Riparian land is proposed to be managed under a Vegetation Management Plan (VMP) appended as **Appendix M.**

The proposed development plan is shown in **Appendix A**.

1.1.5 Site Particulars

Table 1 – Site Particulars

Detail	Comments
Client	Addenbrooke Pty Ltd
Address	Lot 23 Boomerang Drive, Blueys Beach NSW
Title(s)	Lot 23 DP537919
LGA	MidCoast Council
Zoning	Under the Great Lakes Local Environment Plan 2014 (the LEP), the Subject Site is zoned B1 – Neighbourhood Centre, R2 – Low Density Residential, and C4 – Environmental Living. The Study Area also includes RU2 – Rural Landscape and C2 – Environmental Conservation.
BV Mapped Land	No. BV Mapped land is present within Study Area of Lot 23 DP537919, but not within the Subject Site.
Minimum Lot Size	450m^2 / 0.045ha
Clearing Threshold	0.25ha
Study Area	Consists of the Subject Site and 1500m radius buffer around it.
Subject Site	Consists of part Lot 23 and covers approx. 8.88ha including approx. 2.66ha of native vegetation.
VMP Lands	Riparian land in the southern section of the Subject Site along existing hydroline.
Current Land Use	Until recently the Subject Site was used for livestock grazing. It is currently unoccupied, containing a mosaic of disturbed ecotones, comprising improved pasture, derived native grassland, two constructed dams within drainage lines and remnant native vegetation in varying condition.
Surrounding Land Use	The Subject Site is bounded by residential and commercial development to the north and east, cleared land and vegetation to the south and remnant naïve vegetation to the west.

Figure 1 depicts the extent of the site and defines the Subject Site and **Figure 2** depicts the location of the Study Area within the landscape.

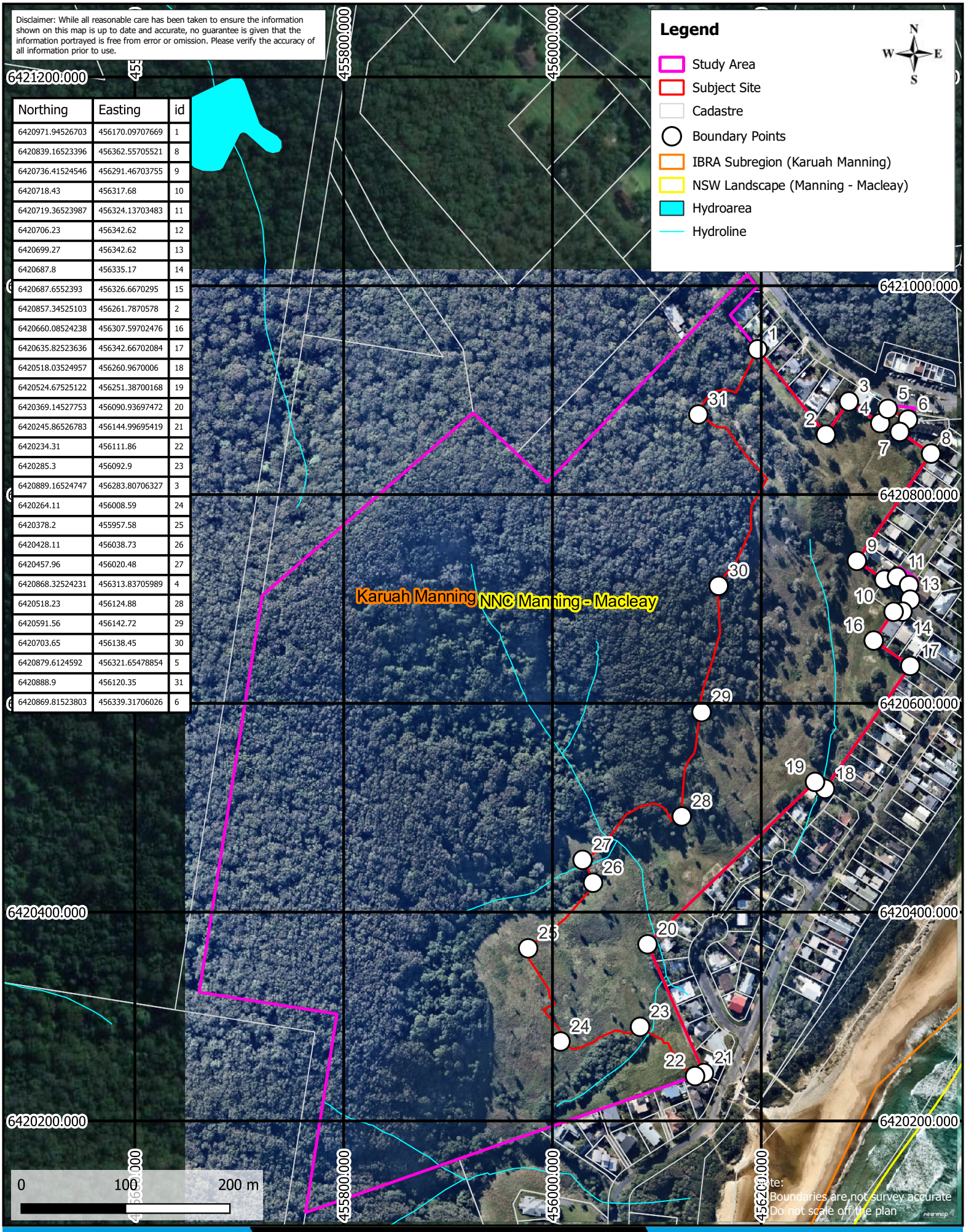
1.1.6 Information Sources

Information and spatial data provided within this BDAR have been compiled from various sources including:

- Field surveys conducted within the site and surrounding areas by AEP (2021/2022);
- State and federal survey guidelines (DEC 2004, SEWPaC 2011, DPIE 2020a and 2020b, OEH 2016, OEH 2018);
- PlantNET NSW (https://plantnet.rbgsyd.nsw.gov.au/);
- Aerial Photograph Interpretation (API) of the site and surrounding locality (Bing 2019; NSW Department of Finance, Services and Innovation 2019; Nearmaps 2022);
- Review of regional mapping for the site (EcoLogical 2006, DPIE 2012, DPE 2022);
- DPE Threatened Biodiversity Profiles (https://www.environment.nsw.gov.au/threatenedSpeciesApp/);
- Collective knowledge gained from previous ecological survey and assessment in the MidCoast Council area over the past 25 years; and
- Anecdotal records.

In addition, database searches were carried out, namely:

- Review of flora and fauna records held by DPE BioNet Atlas of NSW Wildlife within a 10km search of the site (December 2021);
- Review of flora and fauna records held by the Commonwealth Department of Climate Change, Environment, Energy and Water (DCCEEW) Protected Matters Search within a 5km radius of the site (December 2021);
- Review of Bureau of Meteorology (BOM) Groundwater Dependent Ecosystems mapping (January 2022); and
- Review of DPE Important Area Maps (January 2022).



Northing	Easting	id
6420971.94526703	456170.09707669	1
6420839.16523396	456362.55705521	8
6420736.41524546	456291.46703755	9
6420718.43	456317.68	10
6420719.36523987	456324.13703483	11
6420706.23	456342.62	12
6420699.27	456342.62	13
6420687.8	456335.17	14
6420687.6552393	456326.6670295	15
6420857.34525103	456261.7870578	2
6420660.08524238	456307.59702476	16
6420635.82523636	456342.66702084	17
6420518.03524957	456260.9670006	18
6420524.67525122	456251.38700168	19
6420369.14527753	456090.93697472	20
6420245.86526783	456144.99695419	21
6420234.31	456111.86	22
6420285.3	456092.9	23
6420889.16524747	456283.80706327	3
6420264.11	456008.59	24
6420378.2	455957.58	25
6420428.11	456038.73	26
6420457.96	456020.48	27
6420868.32524231	456313.83705989	4
6420518.23	456124.88	28
6420591.56	456142.72	29
6420703.65	456138.45	30
6420879.6124592	456321.65478854	5
6420888.9	456120.35	31
6420869.81523803	456339.31706026	6

AEP

Figure 1 - Site Map

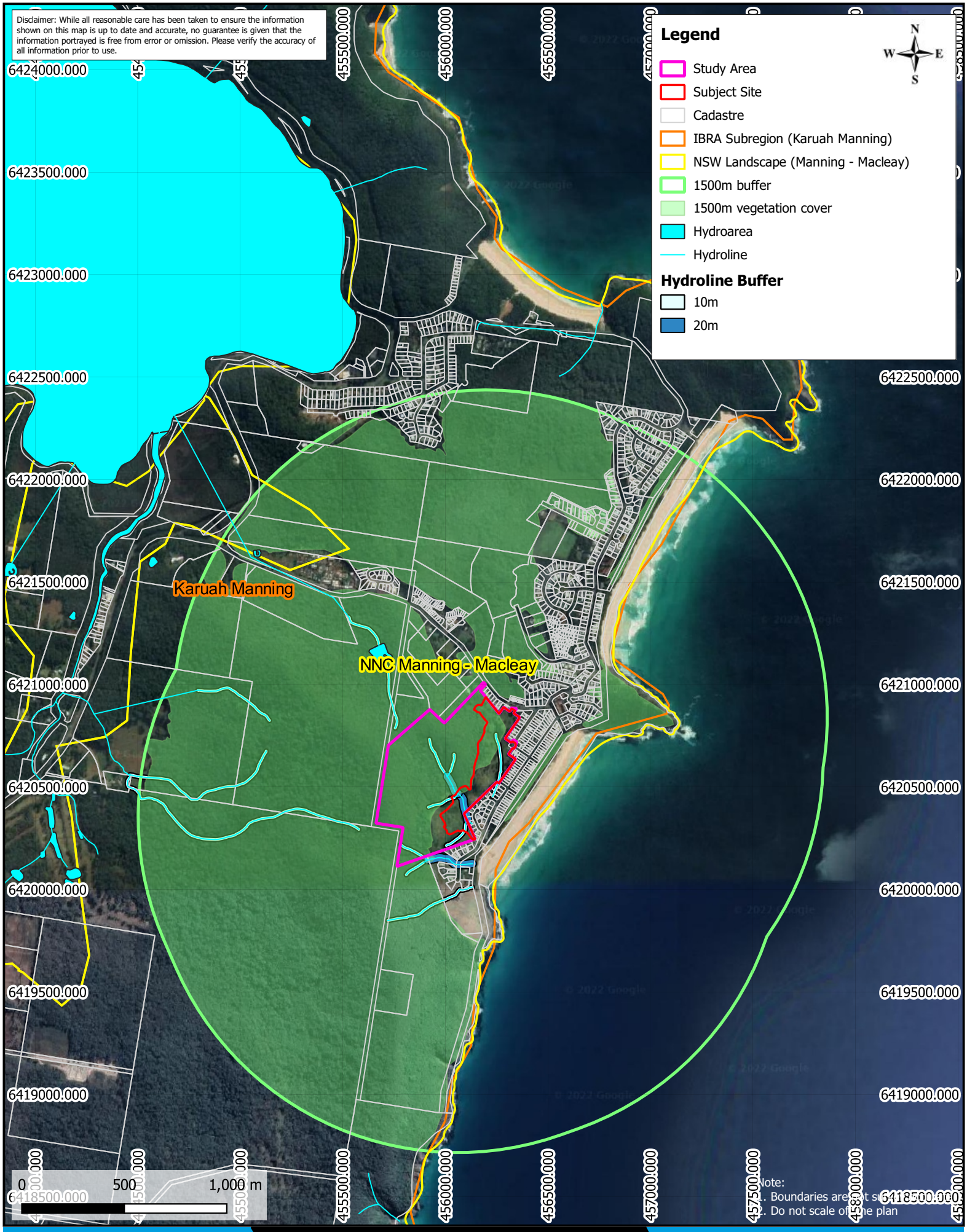
Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 00030048

Client: Addenbrooke Pty Ltd

AEP ref: 2506.03



AEP

Figure 2 - Location Map

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 00030048

Client: Addenbrooke Pty Ltd

AEP ref: 2506.03

1.2 Landscape Features

1.2.1 Site Landscape Description

The Subject Site slopes up to the west. There are several mapped and unmapped drainage lines on the site. The Subject Site has been mapped as containing the following soil characteristics:

- Great Soil Type: Lithosols
- Australian Soil Classification Type: Rudosols
- Hydrologic Soils Group: B – soils having moderate infiltration rates

1.2.2 Landscape Native Vegetation Cover

A 1500m buffer was placed around the site, totalling approximately 974.02ha in size (includes the total area of the Subject Site). Of this, approximately 506ha comprise native vegetation as per Section 4.3.2 of the BAM. This equates to approximately 52% native vegetation cover and was entered as such within the Calculator.

1.2.3 Regional Landscapes

The development site was identified as occurring within the following landscape areas:

- *IBRA Bioregion* – NSW North Coast.
- *IBRA Subregion* – Karuah Manning.
- *NSW Landscape* – Port Macquarie Coastal Ramp.

Delineation of *NSW Landscape* areas are shown in both the Site and Location Maps (**Figure 1** and **Figure 2**).

1.2.4 Identified Landscape Features

The BAM Calculator identifies nine (9) landscape features that require assessment for their relevance to the Subject Site. These features are outlined in **Table 2**:

Table 2 – Landscape Feature Assessment

Landscape Feature	Assessment
Rivers and Streams	Two 1st order and one 2nd order streams are mapped within the Subject Site, however ground-truthing and assessment of characteristics indicate that the location of the streams on site do not match the mapped hydrolines. Two (2) man-made dams occur within the Subject Site. One of the mapped 1st order streams is a drainage line originating from one of these dams that appears to have had a channel modification due to the installation of the dam (refer to **Appendix H**). The 2nd -order stream appears to have been trained into a culvert and drain system underneath residential lots in Ampat Place and Newman Drive. This culvert releases water into the Blueys Beach foredune. Overflow from this stream has been trained along the Subject Site boundary (**Appendix H**).
Wetlands	No mapped wetlands (Resilience and Hazards SEPP or otherwise) occur within the site.
Native Vegetation Extent	Approximately 2.66ha of native vegetation is present on the Subject Site. This consists of: • PCT 1235 - *Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion*, commensurate with EEC *Swamp Sclerophyll Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions* (1.58ha); • PCT 1525 - *Sandpaper Fig - Whalebone Tree warm temperate rainforest*, commensurate with EEC *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregions* (less than 0.01ha); • PCT 1262 - Tallowwood – *Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast* (0.55ha); • PCT 1537 - *Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast*, commensurate with EEC *Littoral Rainforest in NSW North Coast, Sydney Basin and South East Corner Bioregions* (0.13ha); • PCT 1556 - Tallowwood – *Smooth-barked Apple – Blackbutt grass tall open forest of the Central and lower North Coast*, commensurate with EEC *River-flat Eucalypt Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions* (0.10ha); and • PCT 1737 - *Typha rushland*, commensurate with EEC *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions* (0.26ha).
Connectivity Features	The Subject Site contains native vegetation that directly connects to a large patch of dense rainforest, including mapped littoral rainforest. This rainforest starts in Lot 23 and expands to the west.
Karst, Caves, Crevices, Cliffs, Rock and other Geological Features of Significance	There are no identified karst, caves, crevices, cliffs, rock and other geological features of significance within the Subject Site.
NSW Landscape	Port Macquarie Coastal Ramp (**Figure 2**).
Soil hazard features	None known on site.

Landscape Feature	Assessment
Features identified in SEARs for major projects	Proposal is not a major project.
Areas of Outstanding Biodiversity Value (AOBV) under the BC Act:	No areas of AOBV are present on the Subject Site and the adjacent lands.

1.3 Native Vegetation

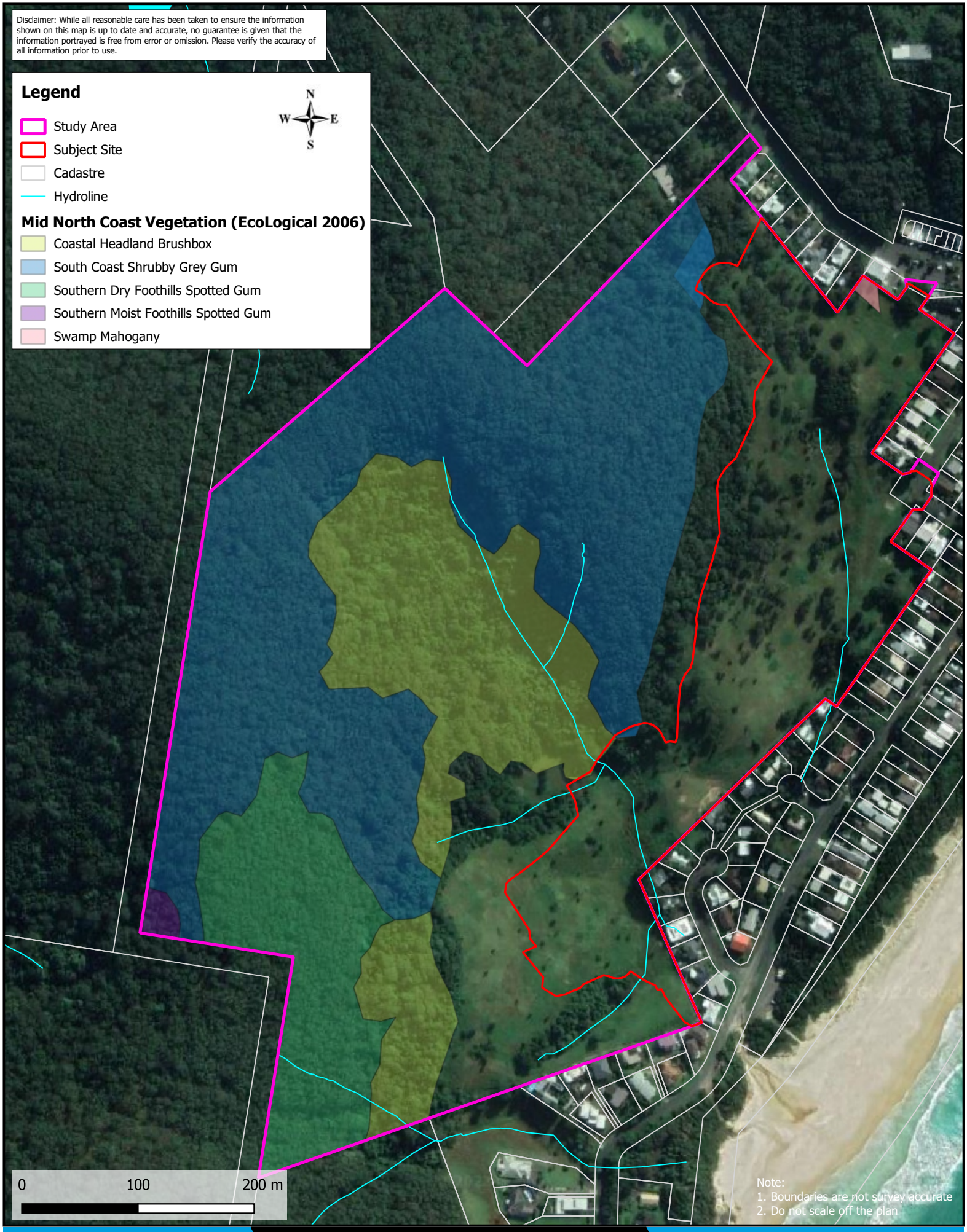
1.3.1 Regional Mapping

Previous datasets consulted include those conducted by EcoLogical (2006), DPIE (2012) and DPE (2022), of which the latter two are the most relevant to vegetation on site. The vegetation communities mapped and their extent within the Subject Site are provided in **Table 3** and **Figures 3 and 4.**

Table 3 - Regional Vegetation Mapping Results (Subject Site)

Vegetation Community	Area (ha)		
	EcoLogical 2006	DPIE 2012	DPE 2022
Coastal Headland Brushbox	0.003	-	-
South Coast Shrubby Grey Gum	0.13	-	-
Swamp Mahogany	0.04	-	-
Tallowwood/Small-fruited Grey Gum/Kangaroo Grass grassy tall open forest on foothills of the lower North Coast	-	3.09	-
Tallowwood/Brush Box/Sydney Blue Gum moist shrubby tall open forest on foothills of lower North Coast	-	1.03	-
Lower North Ranges Turpentine Moist Forest	-	-	0.01
Lower North Spotted Gum-Mahogany-Ironbark Sheltered Forest	-	-	4.18
Myall-Wallis Lakes Littoral Rainforest	-	-	0.14
Northern Foothills Blackbutt Grassy Forest	-	-	0.09
Northern Paperbark-Swamp Mahogany Saw-sedge Forest	-	-	0.04
Other*	8.71	4.76	4.42
Total	**8.88**	**8.88**	**8.88**

* Includes non-descript regenerating native vegetation, non-remnant vegetation, agricultural / cleared / unmapped areas/etc.

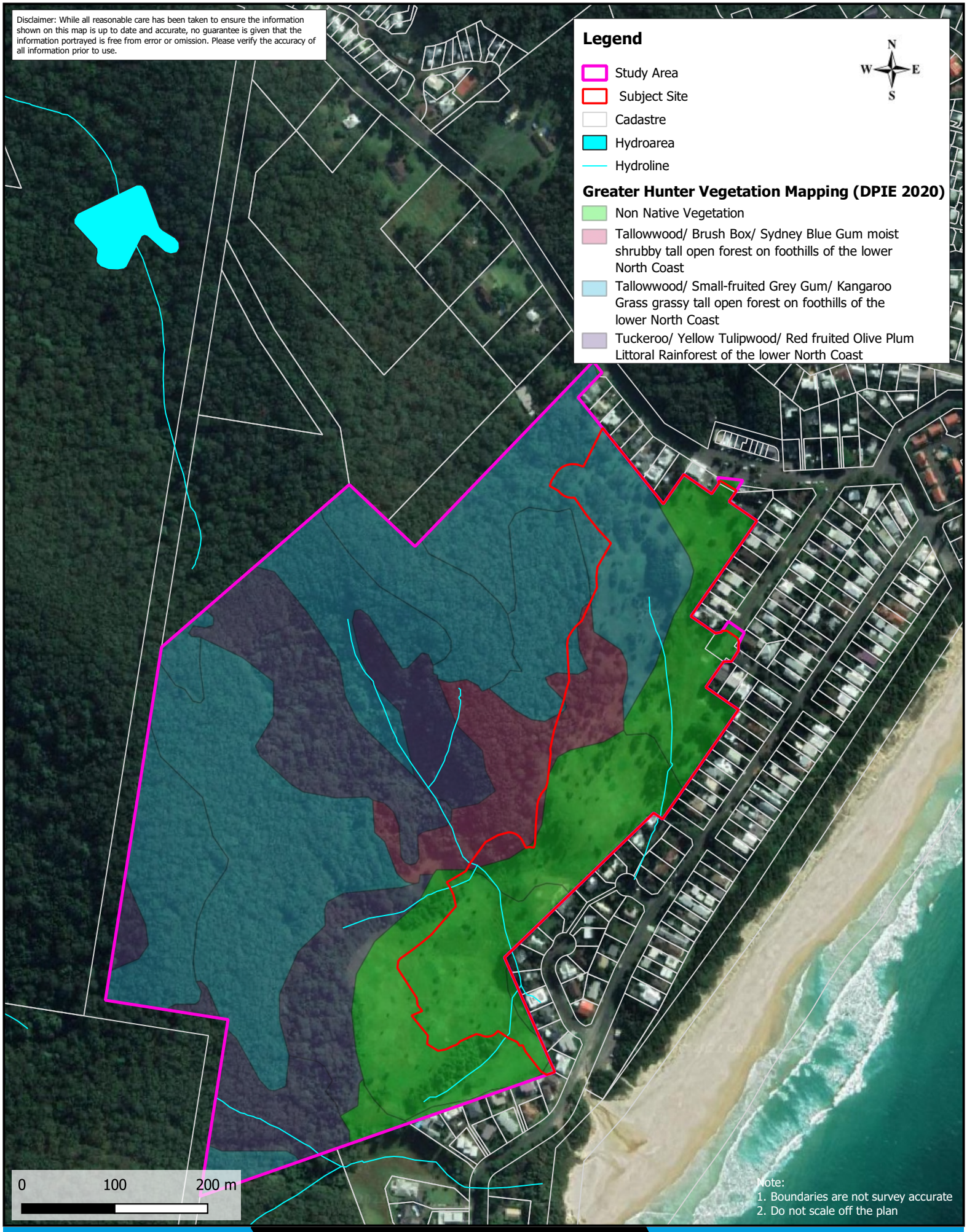


AEP

Figure 3 - Regional Vegetation (EcoLogical 2006) Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach BOAMS: 00030048

Client: Addenbrooke Pty Ltd AEP ref: 2506.03

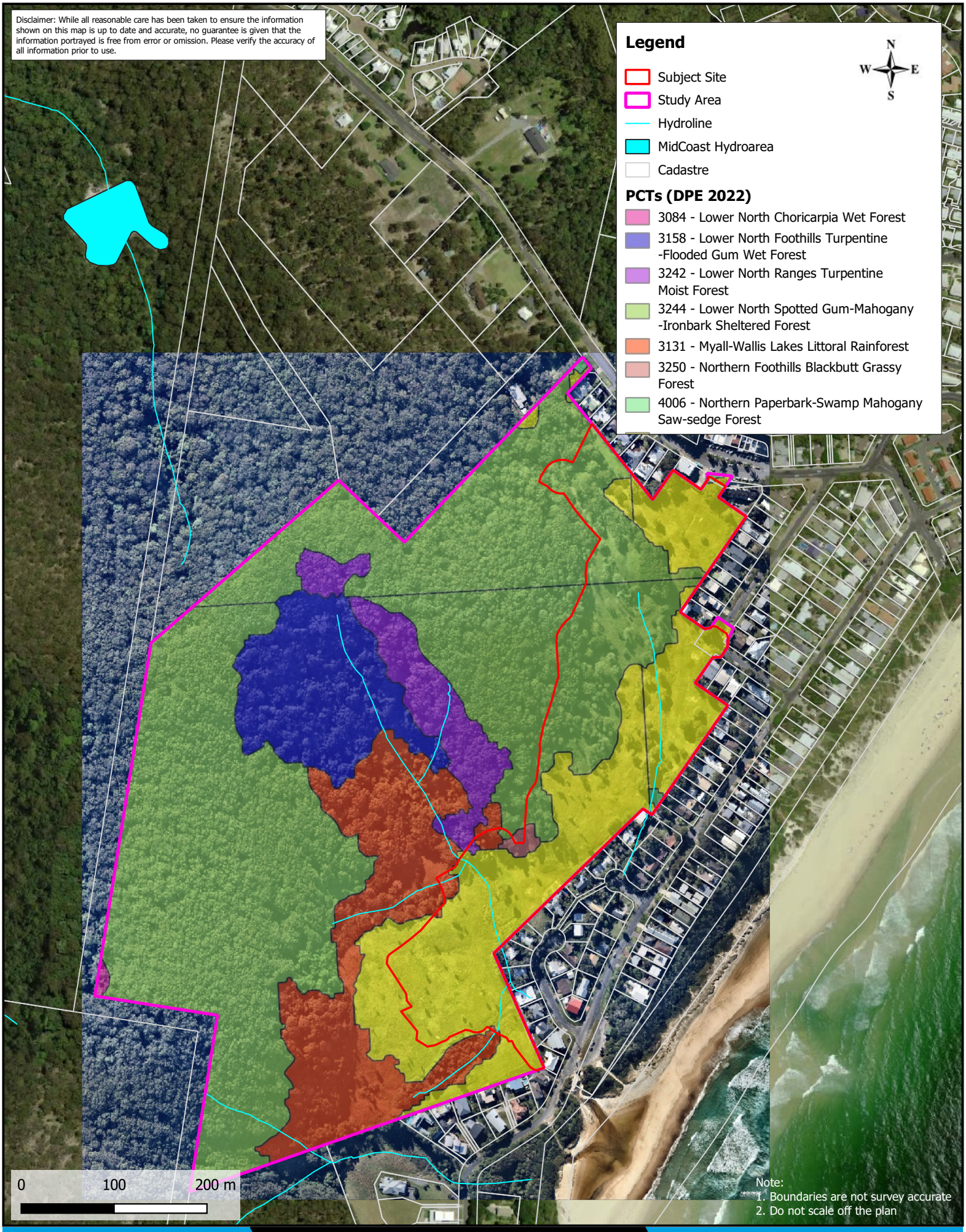


AEP

Figure 4 - Regional Vegetation (DPIE 2020) | Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach | BOAMS: 00030048

Client: Addenbrooke Pty Ltd | AEP ref: 2506.03



AEP

Figure 5 -State Vegetation Type Map (DPE 2022) | Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach | BOAMS: 00030048

Client: Addenbrooke Pty Ltd | AEP ref: 2506.03

1.3.2 Plot Based Floristics Surveys

Plot Based Floristic surveys were undertaken by AEP in November 2021 and February 2022 to identify the most likely Plant Community Types (PCTs) within the Study Area. The surveys are stratified and targeted to assess the expected environmental variation and address any areas with gaps in existing mapping and information.

- Ground-truthing of regional vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices.
- The plot-based floristic vegetation survey is based on a 20 m × 20 m plot (or 400 m^2 equivalent for linear areas). The assessor must assess the plot for the information contained in Table 1 of BAM 2020 and record these data in the BAR. In some cases, plots were located outside of the Subject Site in adjacent vegetation due to the spatial limitations of the vegetation on site, and in other cases, plots had to be modified in size due to the limited extent of a PCT on site.
- Nine (9) BAM plots were undertaken within the remnant native vegetation present within or directly adjacent to the Subject Site. Two (2) of these plots were placed in dams to determine presence or absence of freshwater wetland. One additional plot (Plot 6) was undertaken to sample the non-native grassland and compare it with benchmarks for native grassland. Plots were located by first producing random points via GIS software. Plot locations were adjusted during fieldwork after evaluation of vegetation condition zones and dominant species. Minor modifications to plot locations and shape were made on site due to factors such as ecotones and proximity to disturbed edges.
- Eight (8) Rapid Data Points surveys (RDPs) were undertaken outside of the Subject Site, within the larger Study Area, to determine vegetation extent, delimitation of ecotones and presence of potential PCTs.
- Field sheets are provided in **Appendix F**. Survey effort including plot location is depicted in **Figure 6.** A flora list for all flora species is provided in **Appendix B**.

1.3.3 Plant Community Types and Vegetation Zones

The Subject Site mainly consists of modified remnant vegetation, with varying quality of understory and mid-storey vegetation. In some areas canopy species are present with a sparse, managed shrub and ground layer. The rest of the Subject Site consists of non-native grassland and does not meet the criteria to scientifically determine a PCT.

The BAM's assessment module requires the identification of the PCT or the most likely PCTs, and all TECs, on the Subject Land. The identification must be in accordance with the NSW PCT classification as described in the BioNet Vegetation Classification. The identification of TECs must be consistent with the Threatened Species Scientific Committee Final Determination for the TEC.

Tables 4 to **7** analyse the floristic composition and landscape position of the BAM plots in the community against the Vegetation Information System (VIS) classification system to provide a conclusive identification of five (5) PCTs within the Subject Site:

- PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion, commensurate with EEC *Swamp Sclerophyll Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions*;

- PCT 1262 Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast;
- PCT 1525 - *Sandpaper Fig - Whalebone Tree warm temperate rainforest*, commensurate with EEC *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregions*;
- PCT 1537 - Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast, commensurate with EEC *Littoral Rainforest in NSW North Coast, Sydney Basin and South East Corner Bioregions*;
- PCT 1556 Tallowwood – Smooth-barked Apple – Blackbutt grass tall open forest of the Central and lower North Coast, commensurate with EEC *River-flat Eucalypt Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions*; and
- PCT 1737 - Typha rushland, commensurate with EEC *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.*

Preliminary investigations were conducted within retained lands outside the Subject Site through Rapid Data Point surveys (RDPs). These in conjunction with the BAM surveys identified two potential additional PCTs within the Study Area, outside of the development footprint:

- PCT 1215 – *Spotted Gum – Grey Ironbark open forest of the Macleay Valley lowlands of the NSW North Coast Bioregion*, commensurate with EEC *Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion*.

These are not intended to be impacted by the proposed development.

Fieldwork identified eight (8) vegetation zones within the Subject Site. PCT and vegetation mapping for the Subject Site is shown in **Figure 6**. Additional site photographs are included in **Appendix H**.

Table 4 – Species Data for Potential PCT Determination

Search Item	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10
Dominant Species	*Eucalyptus siderophloia*	*Eucalyptus tereticornis*	*Melaleuca quinquenervia*	*Lophostemon confertus*	*Eucalyptus pilularis*	*Cynodon dactylon*	*Cissus antarcticus*	*Elaeocharis sphacelata*	*Typha orientalis*	*Typha orientalis*
Diagnostic species present	**Upper stratum:** *Eucalyptus siderophloia, Eucalyptus microcorys* (outside plot)	**Upper stratum:** *Casuarina glauca, Eucalyptus tereticornis*	**Upper stratum:** *Casuarina glauca, Melaleuca quinquenervia, Eucalyptus tereticornis*	**Upper stratum:** *Planchonella australis, Livistona australis, Drypetes deplanchei* (outside plot)	**Upper stratum:** *Eucalyptus pilularis, Angophora costata*	**Upper stratum:** N/A	**Upper stratum:** *Streblus brunonianus*	**Upper stratum:** *Casuarina glauca, Melaleuca quinquenervia*	**Upper stratum:** None	**Upper stratum:** *Melaleuca quinquenervia*
	Mid stratum: *Breynia oblongifolia*	**Mid stratum:** *Melaleuca ericifolia, Parsonsia straminea*	**Mid stratum:** None.	**Mid stratum:** *Wilkiea huegeliana, Smilax australis, Dioscorea transversa*	**Mid stratum:** *Glochidion ferdinandi, Breynia oblongifolia*	**Mid stratum:** N/A	**Mid stratum:** *Cissus antarctica, Cissus hypoglauca*	**Mid stratum:** None	**Mid stratum:** N/A	**Mid stratum:** N/A
	Ground stratum: *Grona varians, Dianella caerulea, Glycine clandestine, Lomandra longifolia*	**Ground stratum:** *Gahnia clarkei*	**Ground stratum:** None.	**Ground stratum:** *Doodia aspera, Dianella caerulea*	**Ground stratum:** *Dianella caerulea, Lobelia purpurascens, Imperata cylindrica*	**Ground stratum:** N/A	**Ground stratum:** *Doodia aspera, Oplismenus imbecilis*	**Ground stratum:** None.	**Ground stratum:** *Typha orientalis, Persicaria strigosa*	**Ground stratum:** *Typha orientalis, Persicaria strigosa*
Potential PCTs	**1262, 1558**	**1235, 1550, 1749**	**1230, 1235, 1717, 1724**	**695, 1537, 1571**	**685, 1556, 1621, 1626, 1646**	**Not native**	**669, 1525, 1533, 1534, 1541**	**1235, 1717, 1736, 1740, 1742**	**1737**	**1737**

Table 5 – PCT Determination Plot 1

Plot 1		
Potential PCTs	**1262**	**1558**
Regional Vegetation	Regional mapping projects have mapped this vegetation zone as *Tallowwood / Small-fruited Grey Gum / Kangaroo Grass grassy tall open forest on foothills of the lower North Coast.*	Not mapped on site.
IBRA Region	NSW North Coast	NSW North Coast
IBRA Subregion	Karuah-Manning	Karuah-Manning
NSW Landscape	Port Macquarie Coastal Ramp	Port Macquarie Coastal Ramp
Vegetation Formation	Wet Sclerophyll Forests (Grassy sub-formation)	Wet Sclerophyll Forests (Grassy sub-formation)
Vegetation Class	Northern Hinterland Wet Sclerophyll Forests	Northern Hinterland Wet Sclerophyll Forests
Listed Key Diagnostic Species (VIS)	*Eucalyptus microcorys; Eucalyptus propinqua; Eucalyptus siderophloia; Eucalyptus carnea; Syncarpia glomulifera; Lophostemon confertus; Allocasuarina torulosa; Breynia oblongifolia; Desmodium rhytidophyllum; Desmodium varians; Dianella caerulea; Glycine clandestina; Hibbertia scandens; Lomandra longifolia; Pseuderanthemum variabile; Themeda australis; Vernonia cinerea; Imperata cylindrica var. major*	*Corymbia intermedia; Eucalyptus eugenioides; Eucalyptus resinifera; Eucalyptus propinqua; Allocasuarina littoralis; Glochidion ferdinandi; Pultenaea villosa; Acacia leiocalyx; Kennedia rubicunda; Leucopogon juniperinus; Parsonsia straminea; Oplismenus imbecillis; Imperata cylindrica; Entolasia stricta; Lomandra longifolia; Dianella caerulea; Lobelia purpurascens; Lepidosperma laterale*
Key Diagnostic Species Present within Study Area	Canopy dominated by *E. siderophloia*. Site has been previously cleared (several decades prior) judging by the age of the remaining trees. Few *E. microcorys* remain on site, with scattered individuals near but not within Plot 1. *Breynia oblongifolia, Desmodium* (now *Grona*) *varians, Dianella caerulea, Glycine clandestine, Lomandra longifolia*	*E. siderophloia* is listed as an Upper Stratum Species for this PCT but not as a Key Diagnostic Species. *Kennedia rubicunda*, *Parsonsia straminea, Oplismenus imbecilis, Lomandra longifolia, Dianella caerulea, Lobelia* (now *Pratia*) *purpurascens.*
Vegetation Description	Tall to very tall open forest.	Tall open forests to open forests with a relatively diverse canopy dominated by Corymbia intermedia. The mid-storey consists of diverse shrubs as well as climbers. The mid- storey is dominated by grasses along with various forbs; graminoids and some ferns.
LGA	Not available.	Dungog; Gloucester; Great Lakes; Greater Taree; Port Macquarie-Hastings; Port Stephens
Geographical Limitations	Southern parts of the North Coast	Ranges of the lower North Coast.
Elevation	Information not available	Lower elevations
Lithology	Information not available	Sandstone; Conglomerate
Landscape Position	Coastal lowlands and foothills	Low rises
Current Land Use (disturbance and weed loads)	The land is not currently used, but grassy areas are regularly slashed.	
Previous Land Use (including disturbance levels, plantings)	Historical disturbance such as land clearing, underscrubbing, pasture improvement and ongoing grazing.	
Surrounding Vegetation	Remaining vegetation to the north and west of the Subject Site show signs of previous clearing, but have regenerated in the past several decades. This vegetation is in better condition than vegetation on the Subject Site.	
PCT Determination	Based on above information this PCT was determined as the most accurate description of this vegetation community within the Subject Site. There are more matching diagnostic species present on site, and a more accurate Landscape Position than PCT 1558.	Based on the information above this PCT was not determined as an accurate description of the vegetation community within the Subject Site.
Result	**PCT 1262 - Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast**	

Plot 1	
Estimate cleared value of PCT (%)	30
EEC	Not an EEC
Vegetation Zones	
Vegetation Zones of this PCT within Subject Site	• Poor
Poor Condition	
Description of Vegetation Zone	This vegetation zone is within the northern part of the Subject Site. Plot 1 was located within this vegetation zone. Upper stratum of this vegetation zone is dominated by *Eucalyptus siderophloia.* The Grey Gum present in this zone is *E. canaliculata* rather than the diagnostic *E. propinqua.* There is little midstorey and groundcover, likely due to past clearing and grazing. Twining diagnostic natives include *Grona varians* and *Glycine clandestina*. Diagnostic forbs include *Dianella caerulea var. producta* (Blue Flax-lily) and *Lomandra longifolia* (Spiny-headed Mat-rush). Non-native vegetation is dominated by *Lantana camara*, which forms a dense thicket along part of the boundary between the Subject Site and the remainder of the lot, but has limited density within the Subject Site itself.
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 1.07ha of the Subject Site.

Plate 1 - PCT 1262 BAM Plot 1

Plate 2 - PCT 1262 in Study Area adjacent to Subject Site

Table 6 – PCT Determination Plots 2, 3 and 8

Plots 2, 3 and 8				
Potential PCTs	**1230**	**1235**	**1717**	**1749**
Regional Vegetation	Not mapped onsite.	Not mapped onsite.	Not mapped onsite.	Not mapped onsite.
IBRA Region	NSW North Coast	NSW North Coast	NSW North Coast	NSW North Coast
IBRA Subregion	Karuah Manning	Karuah-Manning	Karuah Manning	Karuah-Manning
NSW Landscape	Information not available	Yuraygir; Coffs Coast and Escarpment; Macleay Hastings; Karuah Manning; Sunshine Coast-Gold Coast Lowlands; Scenic Rim; Clarence Sandstones; Clarence Lowlands; Burringbar-Conondale Ranges	Gosford - Cooranbong Coastal Slopes, Lower Hunter Channels and Floodplains, Manning - Macleay Barriers and Beaches, Manning - Macleay Coastal Alluvial Plains, Myall - Forster Barrier, Myall River Channel and Floodplains, Newcastle Coastal Ramp, Port Macquarie Coastal Ramp, Sydney - Newcastle Barriers and Beaches, Sydney - Newcastle Coastal Alluvial Plains	Information not available.
Vegetation Formation	Forested Wetlands	Forest Wetlands	Forested Wetlands	Forest Wetlands
Vegetation Class	Coastal Swamp Forests	Coastal Floodplain Wetlands	Coastal Swamp Forests	Coastal Floodplain Wetlands
Listed Key Diagnostic Species (VIS)	*Eucalyptus robusta; Melaleuca quinquenervia; Casuarina glauca; Eucalyptus resinifera; Eucalyptus tereticornis; Corymbia intermedia; Lophostemon suaveolens; Acacia maidenii; Baeckea frutescens; Callistemon pachyphyllus; Cordyline stricta; Glochidion ferdinandi; Leptospermum juniperinum; Livistona australis; Melaleuca spp.; Melicope elleryana; Parsonsia straminea; Baloskion tetraphyllum; Blechnum camfieldii; Blechnum indicum; Gahnia spp.; Hypolepis muelleri; Ischaemum australe; Sporadanthus interruptus; Xanthorrhoea fulva*	*Casuarina glauca; Melaleuca quinquenervia; Eucalyptus tereticornis; Goodenia ovata; Hibiscus diversifolius; Melaleuca ericifolia; Melaleuca styphelioides; Parsonsia straminea; Baumea juncea; Enydra fluctuans; Fimbristylis ferruginea; Gahnia clarkei; Ischaemum australe; Juncus kraussi*	*Casuarina glauca; Melaleuca quinquenervia; Eucalyptus robusta; Livistona australis; Melaleuca linariifolia; Glochidion ferdinandi; Entolasia marginata; Gahnia clarkei; Imperata cylindrica; Lomandra longifolia; Dianella caerulea;*	*Eucalyptus punctata; Eucalyptus tereticornis; Angophora floribunda; Eucalyptus canaliculata <--> punctata; Melaleuca linariifolia; Bursaria spinosa; Babingtonia pluriflora; Imperata cylindrica; Echinopogon ovatus; Entolasia marginata; Cymbopogon refractus; Baumea juncea; Gahnia aspera; Oxalis perennans; Pratia purpurascens; Lomandra longifolia*
Present Key Diagnostic Species within Study Area	*Melaleuca quinquenervia, Casuarina glauca, Eucalyptus tereticornis, Glochidion ferdinandi, Livistona australis, Parsonsia straminea*	*Casuarina glauca, Melaleuca ericifolia, Eucalyptus tereticornis, Parsonsia straminea*	*Melaleuca quinquenervia, Casuarina glauca, Glochidion ferdinandi, Livistona australis*	*Eucalyptus tereticornis, Eucalyptus canaliculata, Imperata cylindrica, Entolasia marginata, Lobelia purpurascens, Lomandra longifolia*
Vegetation Description	Mid-high (rarely low) to very tall woodland and forest.	Low to very tall woodland and forest.	Myrtaceous Swamp Open Forests with a mid-stratum of small trees. The ground stratum is dense and dominated by wet-loving grasses and graminoid species.	Open forests with a canopy characterised by *Eucalyptus punctata* in association with *Eucalyptus tereticornis*. The mid-storey consists of a relatively dense shrub layer dominated by myrtaceous shrubs. The ground layer is dominated by grasses and other graminoids.
LGA	Information not available.	Information not available.	Gosford; Great Lakes; Greater Taree; Lake Macquarie; Maitland; Newcastle; Port Macquarie-Hastings; Port Stephens; Wyong	Information not available.
Geographical Limitations	Mainly on the coastal lowlands, but occasionally further inland	Information not available.	This community is common on coastal floodplains and poorly drained lowlands from the Broadwater to Failford. More isolated examples occur as far south as Macmasters Beach.	Restricted to riparian zones in the Rothbury and Stanford Merthyr areas.
Elevation	Information not available	Information not available.	Elevations below 50m	Information not available.
Lithology	Information not available	Information not available.	Information not available	Information not available.

Plots 2, 3 and 8				
Landscape Position	In drainage lines and open depressions	Widespread on poorly drained sites in coastal areas.	Sublittoral Swamps; footslopes; lagoon margins	Swamps
Current Land Use (disturbance and weed loads)	The land is not currently used, but grassy areas are regularly slashed.			
Previous land use (including disturbance levels, plantings)	Historical disturbance such as land clearing, underscrubbing, pasture improvement and ongoing grazing.			
Surrounding Vegetation	Remaining vegetation to the north and west of the Subject Site show signs of previous clearing, but have regenerated in the past several decades. This vegetation is in better condition than vegetation on the Subject Site.			
PCT Determination	Based on the information above this PCT was not determined as an accurate description of the vegetation community within the Subject Site. Vegetation on site does not constitute Swamp Forest.	Based on above information this PCT was determined as the most accurate description of this vegetation community within the Subject Site. This PCT has a matching Vegetation Class to on-site conditions, and is present on poorly drained soils in coastal areas.	Based on the information above this PCT was not determined as an accurate description of the vegetation community within the Subject Site. Vegetation on site does not constitute Swamp Forest.	Based on the information above this PCT was not determined as an accurate description of the vegetation community within the Subject Site. The site is not in a riparian zone in the Rothbury or Stanford Merthyr areas.
Result	**PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion**			
Estimate cleared value of PCT (%)	75			
EEC	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (see **Section 1.3.4.**)			
Vegetation Zones				
Vegetation Zones of this PCT within Subject Site	Poor Melaleuca-dominant Dam			
Poor Condition				
Description of Vegetation Zone	This vegetation zone is located in the north of the Subject Site. Plot 3 was executed within this vegetation zone. The canopy is a mix of *Eucalyptus tereticornis and Melaleuca spp.*, with a significant presence of *Casuarina glauca*. This zone shows evidence of past clearance and disturbance by stock, and regeneration is likely being hampered by coastal salt air. The area around Plot 3, at the coast-facing edge of the large patch of remnant vegetation to the west, has a high level of weeds species, including Bitou Bush and Lantana. A small patch of ecotonal vegetation is present in the north of the site, with the presence of *Syzygium oleosum*. This patch has been subsumed into this zone given its ecotonal nature and the species composition in directly adjacent vegetation.			
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 1.77ha of the Subject Site.			

<table>
<tr><th colspan="2">Plots 2, 3 and 8</th></tr>
<tr><td>
Plate 3 - PCT 1235 BAM Plot 3</td><td>
Plate 4 – PCT 1235 in poor condition</td></tr>
<tr><th colspan="2">Melaleuca-dominant</th></tr>
<tr><td>Description of Vegetation Zone</td><td>This vegetation zone is located in the northern section of the identified PCT 1235 Poor area. A plot was placed here due to the markedly different canopy dominance, which is mostly Melaleuca ericifolia.
The vegetation has been identified as PCT 1235 due to proximity to other areas of PCT 1235 on site and the presence of certain diagnostic species. This area has been highly impacted by past clearing and continues to experience edge effects from slashing and coastal salt air.
The dominant canopy species is Melaleuca ericifolia with an almost equivalent co-dominance of Eucalyptus tereticornis. There is sparse midstorey in the form of young Cupaniopsis anarcardioides and Glochidion ferdinandi, and a few native grasses such as Themeda triandra and Echinopogon caespitosus.</td></tr>
<tr><td>Area of Vegetation Zone (ha)</td><td>This vegetation zone covers approx. 0.01ha of the Subject Site.</td></tr>
<tr><td colspan="2">
Plate 5 - PCT 1235 BAM Plot 2</td><td>
Plate 6 – PCT 1235 view of Plot 2 location from Plot 8 location</td></tr>
<tr><th colspan="2">Dam</th></tr>
<tr><td>Description of Vegetation Zone</td><td>This vegetation zone is located in the centre of the identified PCT 1235 Poor area, around a farm dam. A plot was placed here to determine the presence or absence of Freshwater Wetland EEC.</td></tr>
</table>

Plots 2, 3 and 8	
	Given that the vegetation here is constituted of mainly aquatic plants surrounded by slashed pasture, the vegetation condition is different from other areas of PCT 1235 on the site. The vegetation has been identified as PCT 1235 due to proximity to other areas of PCT 1235 on site and the presence of certain diagnostic species. This area has been highly impacted by past clearing and stock movement, and continues to experience edge effects from slashing and coastal salt air. The only canopy species present is Melaleuca quinquenervia, and specimens are not mature. There is no midstorey, and ground vegetation is primarily aquatic. Non-native waterlily (*Nymphaea caerulea*) and *Paspalum mandiocanum* constitute a significant component of this area.
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0.01ha of the Subject Site.

Plate 7 - PCT 1235 BAM Plot 8

Plate 8 – PCT 1235 view of BAM Plot 8 from opposite corner

Table 7 – PCT Determination Plot 4

Plot 4				
Potential PCTs	**695**	**1263**	**1537**	**1571**
Regional Vegetation	Not mapped onsite	Not mapped onsite	Mapped in DPIE 2012 as being present in the Study Area and in BoM 2021 as being present on the Subject Site.	Not mapped onsite
IBRA Region	NSW North Coast	NSW North Coast	NSW North Coast	NSW North Coast
IBRA Subregion	Karuah Manning	Karuah Manning	Karuah Manning	Karuah Manning
NSW Landscape	Information not provided	Information not provided	Central Hunter Foothills, Manning - Macleay Channels and Floodplains, Manning - Macleay Coastal Alluvial Plains, Manning Great Escarpment Southern Aspects, Nowendoc - Yarras Serpentinite, Scone - Gloucester Foothills, Stroud Mountains, Wauchope Coastal Foothills	Apsley Meta-sediments, Barrington Tops Basalt, Barrington Tops Granite, Barrington Tops Meta-sediments, Bulga Plateau, Comboyne Plateau, Macleay Escarpment Foothills, Manning - Macleay Channels and Floodplains, Manning Great Escarpment Southern Aspects, Moonbi - Walcha Granites, Mount Royal Ridges, Mount Royal Tops, Niangala Plateau and Slopes, Nowendoc - Yarras Serpentinite, Scone - Gloucester Foothills, Stroud Mountains, Tia Tops, Wauchope Coastal Foothills, Yarrowitch Basalt Plateau
Vegetation Formation	Wet Sclerophyll Forests (Shrubby sub-formation)	Wet Sclerophyll Forests (Shrubby sub-formation)	Rainforests	Wet Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	North Coast Wet Sclerophyll Forests	Northern Escarpment Wet Sclerophyll Forests	Littoral Rainforests	Northern Escarpment Wet Sclerophyll Forests
Listed Key Diagnostic Species (VIS)	*Eucalyptus pilularis; Syncarpia glomulifera; Eucalyptus microcorys; Lophostemon confertus; Allocasuarina torulosa; Alpinia caerulea; Archirhodomyrtus beckleri; Breynia oblongifolia; Cissus hypoglauca; Cordyline stricta; Cyathea australis; Elaeocarpus reticulatus; Persoonia media; Polyscias sambucifolia; Psychotria loniceroides; Smilax australis; Trochocarpa laurina; Polyscias sambucifolia subsp. A; Synoum glandulosum; Blechnum cartilagineum; Calochlaena dubia; Dianella caerulea; Dioscorea transversa; Hibbertia scandens; Lomandra longifolia; Pteridium esculentum*	*Eucalyptus saligna; Eucalyptus microcorys; Lophostemon confertus; Allocasuarina torulosa; Breynia oblongifolia; Caldcluvia paniculosa; Cissus antarctica; Cissus hypoglauca; Cryptocarya rigida; Psychotria loniceroides; Synoum glandulosum; Blechnum cartilagineum; Calochlaena dubia; Dianella caerulea; Doodia aspera; Hibbertia scandens; Lomandra longifolia; Smilax australis*	*Cupaniopsis anacardioides; Elaeodendron australe; Drypetes deplanchei; Planchonella australis; Ficus rubiginosa; Elaeocarpus obovatus; Livistona australis; Alphitonia excelsa; Ficus fraseri; Acmena smithii; Wilkiea huegeliana; Sarcomelicope simplicifolia; Pittosporum revolutum; Claoxylon australe; Guioa semiglauca; Cissus antarctica; Smilax australis; Dioscorea transversa; Parsonsia straminea; Diospyros australis; Pellaea falcata; Doodia aspera; Dianella caerulea*	*Eucalyptus saligna; Eucalyptus microcorys; Lophostemon confertus; Ceratopetalum apetalum; Caldcluvia paniculosa; Schizomeria ovata; Synoum glandulosum; Cryptocarya rigida; Elaeocarpus reticulatus; Acmena smithii; Trochocarpa laurina; Acacia melanoxylon; Pittosporum multiflorum; Cyathea australis; Cissus hypoglauca; Blechnum cartilagineum; Lastreopsis decomposita; Lomandra longifolia*
Present Key Diagnostic Species within Study Area	*Lophostemon confertus, Cissus hypoglauca, Synoum glandulosum, Dioscorea transversa, Lomandra longifolia, Dianella caerulea* *Alpinia caerulea* is present in the Study Area north of Plot 4	*Lophostemon confertus, Cissus hypoglauca, Doodia aspera, Synoum glandulosum, Smilax australis, Lomandra longifolia, Dianella caerulea*	*Planchonella australis, Livistona australis, Wilkiea huegeliana, Doodia aspera, Smilax australis, Dioscorea transversa, Dianella caerulea* *Drypetes deplanchei* is present in the Study Area north of Plot 4	*Lophostemon confertus, Synoum glandulosum, Pittospoprum multiflorum, Lomandra longifolia*
Vegetation Description	Tall to extremely tall open forest with a shrubby understorey.	Tall to extremely tall moist open forest.	Low open forest to closed forest with a diverse canopy characterised by *Cupaniopsis anacardioides; Elaeodendron australe* and *Drypetes deplanchei.* The mid-storey is composed of diverse small trees; shrubs and climbers. The ground layer consists of ferns; graminoids and scattered forbs.	Moist tall open forests to open forests dominated by *Eucalyptus saligna* and *E. microcorys*. The mid-storey is semi-mesic and includes diverse small trees and shrubs along with climbers and tree-ferns. The ground layer is dominated by ferns and includes various graminoids.
LGA	Information not provided	Information not provided	Great Lakes; Greater Taree; Maitland; Newcastle; Port Macquarie-Hastings; Port Stephens	Dungog; Gloucester; Great Lakes; Greater Taree; Port Macquarie-Hastings; Port Stephens; Tamworth Regional; Upper Hunter; Walcha
Geographical Limitations	North of the Hunter/Central Rivers CMA area. From the Manning Valley north to the Corindi River.	From Bulga Tops north to Chandlers Creek.	Near coastal areas on coastal lowlands of the lower North coast mainly on sands.	Foothills of Lower North Coast
Elevation	Information not available	High elevations	Information not available	Between 400m and 1000m
Lithology	Information not available	Information not available	Sandstone, Mudstone	Sandstone, chert

Plot 4				
Landscape Position	Foothills and ranges	Patchily distributed on the ranges of the escarpment.	Coastal headlands; coastal sands	Hillslopes, coastal ranges
Current Land Use (disturbance and weed loads)	The land is not currently used, but grassy areas are regularly slashed.			
Previous land use (including disturbance levels, plantings)	Historical disturbance such as land clearing, underscrubbing, pasture improvement and ongoing grazing.			
Surrounding Vegetation	Remaining vegetation to the north and west of the Subject Site show signs of previous clearing, but have regenerated in the past several decades. This vegetation is in better condition than vegetation on the Subject Site.			
PCT Determination	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. The site is not located within the known geographical limitations.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. The site is not located within the known geographical limitations.	Based on above information this PCT was determined as the most accurate description of this vegetation community within the Subject Site. Multiple diagnostic species are present on site, and geographical limitations and landscape position match site conditions.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. Vegetation on site is not a Eucalypt-dominated forest.
Result	**PCT 1537 - Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast**			
Estimate cleared value of PCT (%)	48			
EEC	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions			
Vegetation Zones				
Vegetation Zones of this PCT within Subject Site	Moderate			
Moderate Condition				
Description of Vegetation Zone	Of the vegetation present on site, this vegetation zone constitutes the best quality. It forms part of a larger patch of littoral rainforest that stretches west and south into the Study Area outside the Subject Site. Vegetation in this area shows signs of disturbance, including edge effects, previous clearing and impacts from coastal salt air, but these appear to be old disturbances. West and outside the Subject Site, vegetation quickly improves in value, with mature rainforest trees and vines.			
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0.14ha of the Subject Site.			

Plot 4	
Plate 9 - PCT 1537 BAM Plot 4	Plate 10 - PCT 1537 in adjacent vegetation outside Subject Site

Table 8 – PCT Determination Plot 5

Plot 5					
Potential PCTs	**685**	**1556**	**1621**	**1626**	**1646**
Regional Vegetation	Not mapped onsite	Not mapped onsite	Not mapped onsite	Not mapped onsite	Not mapped onsite
IBRA Region	NSW North Coast	NSW North Coast	NSW North Coast	NSW North Coast	NSW North Coast
IBRA Subregion	Karuah Manning	Karuah Manning	Karuah Manning	Karuah Manning	Karuah Manning
NSW Landscape	Information not provided	Belrose Coastal Slopes, Brothers Peaks, Comboyne Plateau, Gosford - Cooranbong Coastal Slopes, Hornsby Plateau, Lower Hunter Channels and Floodplains, Mangrove Creek Valley, Manning - Macleay Barriers and Beaches, Manning - Macleay Channels and Floodplains, Manning - Macleay Coastal Alluvial Plains, Manning Great Escarpment Southern Aspects, Myall - Forster Barrier, Newcastle Coastal Ramp, Port Macquarie Coastal Ramp, Somersby Plateau, Stroud Mountains, Sydney - Newcastle Barriers and Beaches, Sydney - Newcastle Coastal Alluvial Plains, Sydney Basin Diatremes, Watagan Ranges, Wauchope Coastal Foothills	Belrose Coastal Slopes, Brothers Peaks, Gosford - Cooranbong Coastal Slopes , Hornsby Plateau, Lower Hunter Channels and Floodplains, Manning - Macleay Barriers and Beaches, Manning - Macleay Coastal Alluvial Plains, Myall - Forster Barrier, Myall River Channel and Floodplains, Newcastle Coastal Ramp, Port Macquarie Coastal Ramp, Somersby Plateau, Sydney - Newcastle Barriers and Beaches, Sydney - Newcastle Coastal Alluvial Plains, Sydney Basin Diatremes, Watagan Ranges, Wauchope Coastal Foothills	Myall - Forster Barrier, Newcastle Coastal Ramp, Sydney - Newcastle Barriers and Beaches	Belrose Coastal Slopes, Gosford - Cooranbong Coastal Slopes, Hornsby Plateau, Lower Hunter Channels and Floodplains, Manning - Macleay Barriers and Beaches, Manning - Macleay Coastal Alluvial Plains, Myall - Forster Barrier, Myall River Channel and Floodplains, Newcastle Coastal Ramp, Port Macquarie Coastal Ramp, Stroud Mountains, Sydney - Newcastle Barriers and Beaches, Sydney - Newcastle Coastal Alluvial Plains
Vegetation Formation	Dry Sclerophyll Forests (Shrubby sub-formation)	Wet Sclerophyll Forests (Grassy sub-formation)	Dry Sclerophyll Forests (Shrubby sub-formation)	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	Coastal Dune Dry Sclerophyll Forests	Northern Hinterland Wet Sclerophyll Forests	Sydney Coastal Dry Sclerophyll Forests	Hunter-Macleay Dry Sclerophyll Forest	Coastal Dune Dry Sclerophyll Forests
Listed Key Diagnostic Species (VIS)	*Eucalyptus pilularis; Eucalyptus planchoniana; Angophora costata; Acacia spp.; Banksia aemula; Leucopogon*	*Eucalyptus microcorys; Angophora costata; Eucalyptus pilularis; Allocasuarina torulosa; Polyscias sambucifolia;*	*Angophora costata; Eucalyptus pilularis; Allocasuarina torulosa; Clerodendrum tomentosum; Myrsine variabilis; Polyscias sambucifolia; Breynia oblongifolia; Acacia*	*Angophora costata; Eucalyptus umbra; Corymbia gummifera; Eucalyptus piperita; Eucalyptus capitellata; Eucalyptus pilularis; Pultenaea villosa; Acacia myrtifolia; Lomatia silaifolia; Dodonaea*	*Angophora costata; Eucalyptus pilularis; Corymbia gummifera; Banksia serrata; Monotoca elliptica; Macrozamia communis; Acacia ulicifolia; Dianella caerulea;*

Plot 5					
	lanceolatus; Persoonia virgata; Xanthorrhoea latifolia; Baloskion tetraphyllum; Hibbertia vestita; Pteridium esculentum	*Persoonia linearis; Glochidion ferdinandi; Breynia oblongifolia; Dodonaea triquetra; Imperata cylindrica; Entolasia stricta; Themeda australis; Dianella caerulea; Lomandra longifolia; Lepidosperma laterale; Pratia purpurascens; Glycine clandestina; Vernonia cinerea*	*longifolia; Notelaea longifolia; Eustrephus latifolius; Clematis aristata; Poa affinis; Imperata cylindrica; Oplismenus aemulus; Adiantum aethiopicum; Pteridium esculentum; Lomandra longifolia; Dianella caerulea; Lepidosperma neesii; Pratia purpurascens*	*triquetra; Platylobium formosum; Doryanthes excelsa; Bossiaea rhombifolia; Hakea laevipes; Leptospermum polygalifolium; Smilax glyciphylla; Pandorea pandorana; Themeda australis; Imperata cylindrica; Caustis flexuosa; Patersonia glabrata; Dianella caerulea; Lomandra multiflora*	*Themeda australis; Pteridium esculentum; Lomandra longifolia; Imperata cylindrica*
Present Key Diagnostic Species within Study Area	*Eucalyptus pilularis, Angophora costata, Pteridium esculentum*	*Eucalyptus pilularis, Angophora costata, Glochidion ferdinandi, Breynia oblongifolia, Imperata cylindrica, Entolasia stricta, Lobelia (Pratia) purpurascens, Dianella caerulea, Lomandra longifolia* *Eucalyptus microcorys* is present in contiguous vegetation northwest of Plot 5 outside the Subject Site.	*Eucalyptus pilularis, Angophora costata, Breynia oblongifolia, Eustrephus latifolius, Imperata cylindrica, Oplismenus aemulus, Pteridium esculentum, Lomandra longifolia, Dianella caerulea, Lobelia (Pratia) purpurascens*	*Eucalyptus pilularis, Angophora costata, Smilax glyciphylla, Pandorea pandorana, Imperata cylindrica, Dianella caerulea*	*Eucalyptus pilularis, Angophora costata, Dianella caerulea, Pteridium esculentum, Lomandra longifolia, Imperata cylindrica*
Vegetation Description	Tall to very tall open forest or woodland.	Open forests with a canopy dominated by *Eucalyptus microcorys*. The mid- storey consists of an open shrub layer and the ground layer is a dominated by grasses with various ferns; and forbs.	Open forests to low open forests with a canopy dominated by *Angophora costata*. The mid-storey is typically shrubby and includes scrambling climbers. The ground layer consists of a mix of grasses; graminoids and ferns with scattered forbs.	Open forests to woodlands with an overstorey dominated by *Angophora costata* along with a range of other eucalypts. The mid-storey typically consists of a diverse range of shrubs along with scrambling climbers and often has a high cover of *Doryanthes excelsa*. The ground layer is typically dominated by grasses and graminoids.	Open Forests to Woodlands dominated in the canopy by Angophoras. The sparse mid-stratum is typically two layered the upper characterised by Banksias; the lower comprising a range of shrubs. The ground cover is relatively sparse and is characterised by grasses and ferns.
LGA	Information not provided	Cessnock; Dungog; Gloucester; Gosford; Great Lakes; Greater Taree; Hornsby; Lake Macquarie; Maitland; Newcastle; Pittwater; Port Macquarie-Hastings; Port Stephens; Wyong	Cessnock; Dungog; Gosford; Great Lakes; Greater Taree; Hornsby; Lake Macquarie; Maitland; Newcastle; Pittwater; Port Macquarie-Hastings; Port Stephens; Wyong	Great Lakes, Newcastle, Port Stephens	Cessnock; Dungog; Gloucester; Gosford; Great Lakes; Greater Taree; Hornsby; Lake Macquarie; Maitland; Newcastle; Pittwater; Port Macquarie-Hastings; Port Stephens; Wyong
Geographical Limitations	From the Esk River south to the Hunter River.	Ranges of the lower North Coast.	Coastal lowlands of the Central Coast.	Low hills on the coastal lowlands of the lower North Coast in the Nelson Bay area.	This community extends along the coast from Gosford to Black Head (Darawank Nature Reserve).
Elevation	Information not provided	Mid to lower elevations.	Information not provided	Information not provided	Up to 100m
Lithology	Sandstone	Sandstone	Sandstone, siltstone	Sands	Quaternary dune sands
Landscape Position	Coastal sands	Upper slopes & valleys in dissected terrain; coastal flats and rises	Coastal flats; low rises	Low hills, coastal	Coastal flats, low rises
Current Land Use (disturbance and weed loads)	The land is not currently used, but grassy areas are regularly slashed.				
Previous land use (including disturbance levels, plantings)	Historical disturbance such as land clearing, underscrubbing, pasture improvement and ongoing grazing.				
Surrounding Vegetation	Remaining vegetation to the north and west of the Subject Site show signs of previous clearing, but have regenerated in the past several decades. This vegetation is in better condition than vegetation on the Subject Site.				
PCT Determination	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. The site is not located on coastal dunes.	Based on above information this PCT was determined as the most accurate description of this vegetation community within the Subject Site. The site contains a significant number of diagnostic species, and matches geographic limitations and landscape position.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. The site is not located on the Central Coast.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. The site is not located on sands or in the Nelson Bay area.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. The site is not located on sand dunes.

Plot 5	
Result	**PCT 1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast**
Estimate cleared value of PCT (%)	41
EEC	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
Vegetation Zones	
Vegetation Zones of this PCT within Subject Site	Poor
Poor Condition	
Description of Vegetation Zone	This vegetation zone is located in the southern portion of the Subject Site, on the south facing slope. Vegetation is in poor condition, with evidence of past clearing and stock impacts, as well as continued slashing of non-native pasture grasses and impacts from coastal salt air. The dominant species is *Eucalyptus pilularis*. Vegetation in the west outside the Subject Site also includes specimens of the diagnostic species *Eucalyptus microcorys*. The midstorey is sparse, although some evidence of regenerating midstorey species is apparent. This vegetation zones contains many vines and scramblers and a variety of graminoids. Weed density is relatively low within the vegetation zone, increasing towards the eastern edge at the boundary with the pasturelands. Non-native species include *Senna pendula*, *Adenophora ageratina* and *Asparagus spp.,* which are found throughout the Subject Site.
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0.23ha of the Subject Site.

Plate 11 - PCT 1556 BAM Plot 5

Plate 12 - PCT 1556 in adjacent vegetation outside of Subject Site

Table 9 – PCT Determination Plot 7

Plot 7					
Potential PCTs	**669**	**1525**	**1533**	**1534**	**1541**
Regional Vegetation	Not mapped onsite	Not mapped onsite	Not mapped onsite	Not mapped onsite	Not mapped onsite
IBRA Region	NSW North Coast	NSW North Coast	NSW North Coast	NSW North Coast	NSW North Coast
IBRA Subregion	Karuah Manning	Karuah Manning	Karuah Manning	Karuah Manning	Karuah Manning
NSW Landscape	Information not provided	Barrington Tops Meta-sediments, Bucketty Ridges, Central Hunter Alluvial Plains, Central Hunter Foothills, Gosford - Cooranbong Coastal Slopes, Lower Hunter Channels and Floodplains, Mangrove Creek Valley, Manning Great Escarpment Southern Aspects, Newcastle Coastal Ramp, Scone - Gloucester Foothills, Stroud Mountains, Sydney - Newcastle Barriers and Beaches, Sydney - Newcastle Coastal Alluvial Plains, Sydney Basin Diatremes, Watagan Ranges	Apsley Meta-sediments, Barrington Tops Basalt, Barrington Tops Granite, Barrington Tops Meta-sediments, Bulga Plateau, Comboyne Plateau, Macleay Escarpment Foothills, Manning - Macleay Channels and Floodplains, Manning Great Escarpment Southern Aspects, Nowendoc - Yarras Serpentinite, Scone - Gloucester Foothills, Stroud Mountains, Tia Tops, Wauchope Coastal Foothills, Yarrowitch Basalt Plateau	Central Hunter Foothills, Manning - Macleay Channels and Floodplains, Manning - Macleay Coastal Alluvial Plains, Manning Great Escarpment Southern Aspects, Nowendoc - Yarras Serpentinite, Scone - Gloucester Foothills, Stroud Mountains, Wauchope Coastal Foothills	Barrington Tops Meta-sediments, Central Hunter Alluvial Plains, Central Hunter Foothills, Hunter River Basalts, Lower Hunter Channels and Floodplains, Manning Great Escarpment Southern Aspects, Newcastle Coastal Ramp, Scone - Gloucester Foothills, Watagan Ranges
Vegetation Formation	Rainforests	Rainforests	Rainforests	Rainforests	Rainforests
Vegetation Class	Dry Rainforests	Dry Rainforests	Subtropical rainforests	Subtropical rainforests	Dry Rainforests
Listed Key Diagnostic Species (VIS)	*Castanospermum australe; Waterhousea floribunda; Grevillea robusta; Tristaniopsis laurina; Syzygium francisii; Dysoxylum fraserianum; Arytera divaricata; Cryptocarya triplinervis; Acmena smithii; Diospyros pentamera; Alphitonia excelsa; Streblus brunonianus; Baloghia inophylla; Ficus coronata; Austromyrtus acmenoides; Acacia fimbriata; Alchornea ilicifolia; Alyxia ruscifolia; Cissus antarctica; Cissus hypoglauca; Cryptocarya microneura; Guilfoylia monostylis; Leptospermum brachyandrum; Maclura cochinchinensis; Morinda jasminoides; Pandorea pandorana; Platycerium superbum; Psychotria loniceroides; Adiantum aethiopicum; Alocasia brisbanensis; Dianella caerulea; Lastreopsis munita; Lomandra longifolia; Oplismenus aemulus; Pseuderanthemum variabile*	*Ficus coronata; Streblus brunonianus; Acmena smithii; Doryphora sassafras; Claoxylon australe; Diospyros australis; Alectryon subcinereus; Neolitsea dealbata; Synoum glandulosum; Syzygium australe; Cissus antarctica; Cissus hypoglauca; Adiantum formosum; Doodia aspera; Oplismenus imbecillis; Urtica incisa*	*Dysoxylum fraserianum; Pennantia cunninghamii; Doryphora sassafras; Dendrocnide excelsa; Acmena smithii; Caldcluvia paniculosa; Polyosma cunninghamii; Baloghia inophylla; Sloanea australis; Brachychiton acerifolius; Ficus coronata; Streblus brunonianus; Pittosporum multiflorum; Tasmannia insipida; Eupomatia laurina; Daphnandra micrantha; Dicksonia antarctica; Cissus antarctica; Palmeria scandens; Cissus hypoglauca; Arthropteris tenella; Asplenium australasicum; Microsorum scandens; Adiantum formosum; Lastreopsis microsora; Elatostema reticulatum; Urtica incisa*	*Heritiera actinophylla; Dendrocnide excelsa; Dysoxylum fraserianum; Ficus macrophylla; Streblus brunonianus; Baloghia inophylla; Mallotus philippensis; Capparis arborea; Pittosporum multiflorum; Hibiscus heterophyllus; Claoxylon australe; Diospyros australis; Diospyros pentamera; Cissus antarctica; Tetrastigma nitens; Pellaea falcata; Pellaea paradoxa; Adiantum formosum; Arthropteris tenella; Doodia aspera;*	*Streblus brunonianus; Mallotus philippensis; Planchonella australis; Olea paniculata; Elaeocarpus obovatus; Dysoxylum fraserianum; Dendrocnide excelsa; Pittosporum multiflorum; Alectryon subcinereus; Notelaea longifolia; Diospyros australis; Claoxylon australe; Clerodendrum tomentosum; Capparis arborea; Cissus antarctica; Dioscorea transversa; Cayratia clematidea; Oplismenus aemulus; Pseuderanthemum variabile; Adiantum formosum; Gymnostachys anceps*
Present Key Diagnostic Species within Study Area	*Cissus antarctica, Cissus hypoglauca, Oplismenus aemulus, Ficus coronata*	*Cissus antarctica, Cissus hypoglauca, Doodia aspera, Ficus coronata, Streblus brunonianus*	*Cissus antarctica, Cissus hypoglauca, Ficus coronata, Pittosporum multiflorum, Streblus brunonianus*	*Cissus antarctica, Doodia aspera, Pittospprum multiflorum*	*Cissus antarctica, Notelaea longifolia, Oplismenus aemulus, Pittosporum multiflorum, Streblus brunonianus*
Vegetation Description	Information not provided	Open forests to closed forests characterised by *Ficus coronata* and *Streblus brunonianus*. The	Closed forests with a highly diverse canopy characterised by *Dysoxylum fraserianum; Pennantia cunninghamii* and *Doryphora*	Open to closed forests with a diverse canopy dominated by *Heritiera actinophylla; Dendrocnide excelsa; Dysoxylum fraserianum* and *Ficus*	Open forests to closed forests with a canopy characterised by *Streblus brunonianus* and *Mallotus philippensis*. The mid-storey consists of

Plot 7					
		mid storey consists of a range of smaller trees and tall shrubs and various climbers. The mid-storey is typically ferny with sparse forbs and graminoids.	*sassafras*. An open mid storey of smaller trees; shrubs and climbers is commonly present. The ground layer is characteristically ferny with sparse graminoids and forbs.	*macrophylla*. The mid-storey includes a diverse range of small trees along with shrubs and climbers. The ground layer is typically ferny with forbs and graminoids uncommon.	various small trees; shrubs and climbers. The ground layer is typically sparse and consists of ferns; graminoids and forbs.
LGA	Information not provided	Gloucester; Gosford; Great Lakes; Greater Taree; Hawkesbury; Lake Macquarie; Liverpool Plains; Maitland; Muswellbrook; Newcastle; Port Stephens; Singleton; Upper Hunter; Wyong	Dungog; Gloucester; Great Lakes; Greater Taree; Muswellbrook; Port Macquarie-Hastings; Port Stephens; Singleton; Tamworth Regional; Upper Hunter; Walcha	Dungog; Gloucester; Great Lakes; Greater Taree; Liverpool Plains; Maitland; Muswellbrook; Port Macquarie-Hastings; Port Stephens; Singleton; Tamworth Regional; Upper Hunter; Walcha	Cessnock; Dungog; Gloucester; Great Lakes; Hawkesbury; Lake Macquarie; Liverpool Plains; Maitland; Muswellbrook; Newcastle; Port Stephens; Singleton; Upper Hunter; Wyong
Geographical Limitations	Information not provided	Ranges and foothills of the lower North Coast and Central Coast	Restricted to the Barrington Tops area	Lowland areas of the lower North Coast	Sheltered sites on ranges of the Hunter Valley and lower North Coast escarpment
Elevation	Information not provided	Elevations below 700m	Mid elevations	Information not provided	Mid to low elevations
Lithology	Usually occurs on alluvium along river banks, rarely on siliceous soils.	Sandstone, siltstone	Sandstone, Greywacke	Sandstone, volcanic breccia	Sandstone
Landscape Position	Gallery or riparian rainforest	Minor valleys; valley heads	Southern slopes	Lowlands	Upper slopes, flats, valleys
Current Land Use (disturbance and weed loads)	The land is not currently used, but grassy areas are regularly slashed.				
Previous land use (including disturbance levels, plantings)	Historical disturbance such as land clearing, underscrubbing, pasture improvement and ongoing grazing.				
Surrounding Vegetation	Remaining vegetation to the north and west of the Subject Site show signs of previous clearing, but have regenerated in the past several decades. This vegetation is in better condition than vegetation on the Subject Site.				
PCT Determination	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. Vegetation on site is not gallery or riparian.	Based on above information this PCT was determined as the most accurate description of this vegetation community within the Subject Site. A significant number of diagnostic species are present, with the identified canopy species being those known to characterise this PCT. Geographical limitations are matched.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. The site is not in the Barrington Tops area.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. Few diagnostic species are present, and a shrub layer is lacking.	Based on above information this PCT was not determined as the most accurate description of this vegetation community within the Subject Site. Although similar to the vegetation present, PCT 1525 has a better overall fit.
Result	**PCT 1525 - Sandpaper Fig - Whalebone Tree warm temperate rainforest**				
Estimate cleared value of PCT (%)	68				
EEC	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions				
Vegetation Zones					
Vegetation Zones of this PCT within Subject Site	Poor				
Poor Condition					

Plot 7	
Description of Vegetation Zone	This vegetation zone consists of a single patch of remnant vegetation along a drainage line in the south of the Study Area. It is highly disturbed and surrounded by slashed pastureland. The overstorey is dense, whilst the vegetation edges are dominated by *Senna pendula*. The upper canopy density has resulted in a sparse mid and understorey. The drainage line is significantly eroded, with rock protrusions.
Area of Vegetation Zone (ha)	This vegetation community is not located within the Subject Site, but directly abuts the development footprint in the south of the Study Area.

Plate 13 - PCT 1525 BAM Plot 7

Plate 14 - PCT 1525 Poor Condition

Table 10 – PCT Determination Plot 9

Plots 9 and 10	
Potential PCTs	**1737**
Regional Vegetation	Not mapped on site.
IBRA Region	NSW North Coast
IBRA Subregion	Karuah Manning
NSW Landscape	Information not provided
Vegetation Formation	Freshwater Wetlands
Vegetation Class	Coastal Freshwater Lagoons
Listed Key Diagnostic Species (VIS)	*Typha orientalis; Persicaria strigosa; Cladium procerum; Cynodon dactylon*
Present Key Diagnostic Species within Study Area	*Typha orientalis, Persicaria strigosa* *Melaleuca quinquenervia* is a known species of this PCT that is not diagnostic but may occur.
Vegetation Description	Tall Rushlands dominated by Typha. Melaleuca may occur as isolated emergent.
LGA	Information not provided
Geographical Limitations	Along the coast from about Woy Woy to Hexham. There is one isolated occurrence in the Goulburn River NP.
Elevation	Coastal occurrences have elevations of less than 50m. The western occurrence has an elevation of 367m.
Lithology	Sands and muds
Landscape Position	Typically occurs at the margins of standing fresh water.
Current Land Use (disturbance and weed loads)	The land is not currently used, but grassy areas are regularly slashed.
Previous land use (including disturbance levels, plantings)	Historical disturbance such as land clearing, underscrubbing, pasture improvement and ongoing grazing.
Surrounding Vegetation	Remaining vegetation to the north and west of the Subject Site show signs of previous clearing, but have regenerated in the past several decades. This vegetation is in better condition than vegetation on the Subject Site.
PCT Determination	A VIS search using the IBRA Subregion “Karuah Manning” and dominant species “*Typha orientalis*” produces only PCT 1737. For this reason, this PCT was determined as the most accurate description of this vegetation community within the Subject Site.
Result	**PCT 1737 - Typha rushland**
Estimate cleared value of PCT (%)	70
EEC	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
Vegetation Zones	

Plots 9 and 10	
Vegetation Zones of this PCT within Subject Site	Degraded
Degraded Condition	
Description of Vegetation Zone	This vegetation zone is located in the southern portion of the Subject Site. It follows a drainage line running from littoral rainforest in the west down to the eastern boundary of the site. The zone is narrow, consisting of the channel and banks of the drainage line, and surrounded on either side by slashed pastureland. The vegetation condition is likely owing to previous stock pressures and edge effects. A tenth plot (Plot 10) identified another patch of PCT 1737 in a dam outside the Subject Site and to the west. Scattered *Livistona australis*, likely present due to the zone's location downstream of PCT 1537, are located along the drainage line. The dominant species are *Persicaria strigosa* and *Typha orientalis,* two diagnostic species of PCT 1737. There is also a significant proportion of non-native weed species that are also present through the site, such as *Senna pendula, Paspalum spp*. and *Lantana camara.*
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 0.26ha of the Subject Site.

Plate 15 - PCT 1737 BAM Plot 9

Plate 16 - PCT 1737 degraded condition (discounted Plot 10)

Cleared / Non-native Grassland

The remaining 6.22ha of the Subject Site has been identified as non-native vegetation and cleared land containing previously grazed paddocks and several dams. It is almost entirely devoid of native species and is dominated by non-native grasses such as *Cenchrus clandestinus* (Kikuyu), *Andropgon virginicus* (Whisky Grass) and *Setaria spp.* (Pigeon Grass) likely introduced in the scope of pasture improvement for cattle grazing. Other exotic species present include *Senecio madagascariensis* (Fireweed), *Hypochaeris radicata* (Catsear), *Trifolium repens* (White Clover), and *Lysimachia arvensis* (Scarlet Pimpernel).

Cynodon dactylon (Couch) is co-dominant with Kikuyu. Although native, this species is considered non-endemic and potentially invasive in locations east of the Great Dividing Range in NSW.

A minor component of native groundcover is present within this area including *Viola sp.* (Native Violet) and *Oxalis perennans*. One BAM plot was undertaken within this zone to sample the non-native grassland and compare it with benchmarks for native grassland. It was confirmed that while a minor native component was present, the vegetation was dominated by non-native species and did not meet benchmarks for native grasslands.

The extent of the non-native grassland was determined through aerial photography interpretation and during site walkovers and other survey work. Site walkovers for vegetation mapping identified at a coarse level the extent of native compared to non-native vegetation, and this was refined during threatened flora transects.

Plate 17 – Non-native Grassland present within the Subject Site

Table 11 provides a summary of the vegetation zones and areas within the Study Area and Subject Site.

Table 11 – Summary of Vegetation Areas

Vegetation Community	Condition	Total Study Area (ha)	Total Subject Site (ha)	Area of Removal (ha)	Area of Retention (ha)	Area Proposed for Regeneration (under VMP)
PCT 1215	Good	13.82	0	0	13.82	0
PCT 1235	Poor	2.34	1.33	1.33	1.01	0
PCT 1235	Melaleuca-dominated	0.18	0.18	0.18	0	0
PCT 1235	Dam	0.07	0.07	0.07	0	0
PCT 1262	Poor	2.26	0.55	0.55	1.71	0
PCT 1525	Poor	0.33	<0.01	<0.01	0.33	0
PCT 1537	Moderate	5.81	0.13	0.13	5.68	0
PCT 1556	Poor	2.32	0.1	0.1	2.22	0
PCT 1737	Moderate	0.27	0.26	0.17	0.1	0.1
Total Native Vegetation (ha)		**27.15**	**2.62**	**2.27**	**24.88**	**0.1**
Non-native grassland / paddocks		7.89	6.26	6.2	1.69	0.06
Dams		0.04	0.04	0.04	0	0
Total Non-native/ Cleared		**7.93**	**6.3**	**6.24**	**1.69**	**0.06**
Total (ha)		**35.08**	**8.88**	**8.51**	**26.57**	**0.16**

** There may be minor errors in numbers due to rounding*

1.3.4 Threatened Ecological Community Assessment

Of the six (6) PCTs on the Subject Site five (5) are associated with TECs. These are:

Table 12 - TECs on Subject Site

PCT	Associated TECs
1235	• Swamp Oak Floodplain Forest of the NSW North Coast, Sydney Basin and South East Corner Bioregions • Coastal Saltmarsh in the NSW North Coast, Sydney Basin and South East Corner Bioregions • Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
1525	• Lowland Rainforest in NSW North Coast and Sydney Basin Bioregions
1537	• Littoral Rainforest in the NSW North Coast, Sydney Basin and South East Corner Bioregions
1556	• River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions
1737	• Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions

Field surveys have confirmed the equivalence of these PCTs on site with TECs. Below is an assessment to determine the TEC present on site in areas of PCT 1235.

Table 13 - PCT 1235 associated TEC assessment

TEC	Characteristics	Present on Site
Swamp Oak Floodplain Forest	• Dense to sparse tree layer (dominated by *Casuarina glauca*) • Distributed along entire NSW coastal floodplain • Associated with humic clay or sandy loam soils • Common species: *Acmena smithii, Glochidion spp., Melaleuca spp., Parsonsia straminea, Geitonoplesium cymosum, Stephania japonica var. discolor, Centella asiatica, Commelina cyanea, Persicaria decipiens, Viola banksii, Carex appressa, Gahnia clarkei, Lomandra longifolia, Oplismenus imbecilis, Hypolepis muelleri*	• Dense to open tree layer dominated by *Melaleuca spp.* • Located on NSW coastal floodplain • Mapped soil type is lithosols/rudosols which are typically sandy • Species present: *Glochidion ferdinandi var. ferdinandi., Melaleuca spp., Geitonoplesium cymosum, Stephania japonica, Commelina cyanea, Persicaria decipiens, Viola banksii, Carex appressa*
Coastal Saltmarsh	• No canopy species • Distributed along entire NSW coastal floodplain • Typically found as an intertidal zone • Close to/fringing saline or semi-saline coastal estuary/lagoon	• Canopy species present • Located on NSW coastal floodplain • Not in intertidal zone, near estuaries or lagoons, nor located behind mangrove stands

TEC	Characteristics	Present on Site
	• On flat land behind stands of mangroves • Common species: *Machaerina juncea, Ficinia nodosa, Juncus krausii, Samolus repens, Sarcornia quinqueneflora, Selliera radicans, Sporobolus virginicus, Suaeda australis, Triglochin striata, Zoysia macrantha*	• None of the common species are present on site.
Swamp Sclerophyll Forest	• Open to dense tree layer • Distributed along entire NSW coastal floodplain • Associated with humic clay or sandy loam soils • Subject to waterlogging and/or below highest flood level • Common species: *Eucalyptus robusta, Melaleuca quinquenervia, Callistemon salignus, Casuarina glauca, Eucalyptus resinifera subsp. hemilampra, Livistona australis, Lophostemon suaveolens, Leptospermum polygalifolium, Acacia longifolia, Gahnia clarkei, Pteridium esculentum, Dianella caerulea, Viola hederacea, Lomandra longifolia*	• Open to dense tree layer • Located on NSW coastal floodplain • Mapped soil type is lithosols/rudosols which are typically sandy • Wet areas, including dams and hydrolines • Species present: *Eucalyptus robusta, Melaleuca quinquenervia, Callistemon salignus, Casuarina glauca, Livistona australis, Leptospermum polygalifolium, Acacia longifolia, Hypolepis muelleri*

Based on the above, it is determined that PCT 1235 on site best matches EEC *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*.

1.3.5 Vegetation Integrity Assessment

1.3.5.1 Patch Size

The native vegetation that exists within the Subject Site is connected to vegetation to the west, north and south that, as defined by the BAM, extends as a patch for several hundred hectares. The maximum patch size of '≥100ha' is therefore appropriate for each vegetation zone and was entered as such within the Calculator.

1.3.6 Vegetation Integrity Score

Plot data was used to determine the composition, structure and function condition score the vegetation zones within the Subject Site, which informed the vegetation integrity score. Plot data has been tabulated (refer **Table 14**) and includes corresponding condition scores along with the overall vegetation integrity score. Note that Plot 2 data were not utilised as this plot was located outside of the Subject Site. Vegetation Condition Class has been rated using the following percentage bands associated with the Vegetation Integrity Scores:

- 70 – 100 Good;

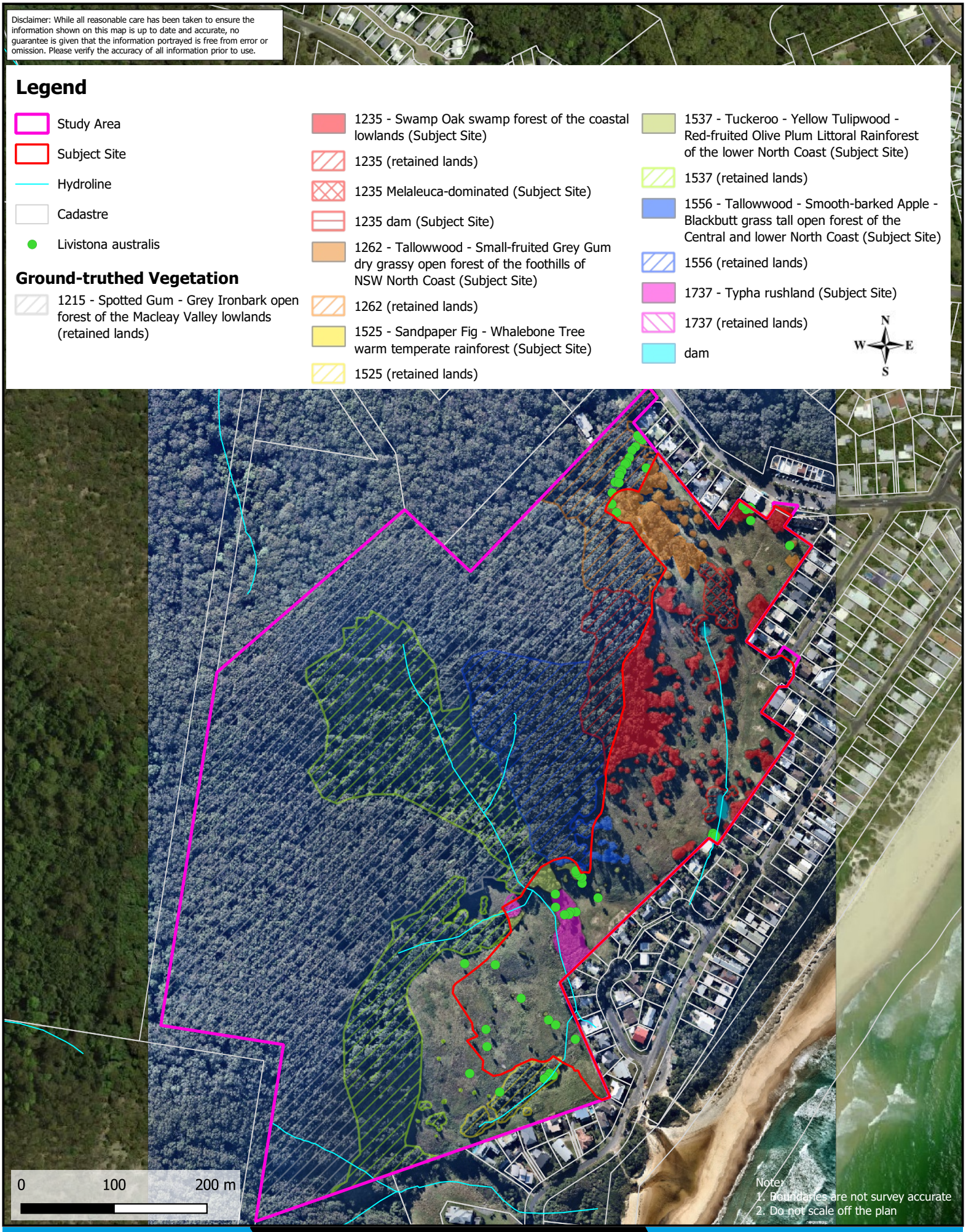
- 50 – 69 Moderate;
- 35 – 49 Poor;
- 25-34 Degraded;
- 17-24 Highly Degraded; and
- > 17 Severely Degraded.

Table 14 - Vegetation Integrity Score Table

Site Attribute	PCT 1262 (Poor)	PCT 1235 (Melaleuca-dominated)	PCT 1235 (Poor)	PCT 1537 (Moderate)	PCT 1556 (Poor)	PCT 1525 (Poor)	PCT 1235 (dam)	PCT 1737 (Highly Degraded)	
Plot #	1	2	3	4	5	7	8	9	10
Location	456161E 6420832N	456261E 6420799N	456194E 6420653N	455902E 6420359N	456094E 6420547N	456083E 6420268N	456259E 6420743N	456088E 6420466N	456049E 6420449N
Bearing	150°	167°	177°	168°	305°	250°	225°	141°	220°
Tree	5	7	6	10	7	6	2	1	2
Shrub	11	8	8	10	8	8	0	2	1
Grass & Grass-like	10	11	11	8	6	3	6	5	6
Forb	10	6	10	3	5	0	3	5	4
Fern	1	0	0	1	3	2	0	0	2
Other	15	10	7	15	15	8	0	3	0
Total Composition Score	**88.1**	**94.3**		**91.9**	**83**	**62.8**	**35.9**	**98.8**	
Tree	40.6	23.4	41.2	34.2	53.9	1.6	7	0.1	0.2
Shrub	1.2	11.7	1.4	12.2	0.9	23.5	0	0.2	0.1
Grass & Grass-like	1.3	1.3	2.1	1.5	0.7	0.3	31.4	30.8	90.7
Forb	1	0.6	1.6	0.3	0.7	0	0.3	30.4	7.3
Fern	0.1	0	0	1	0.4	0.5	0	0	0.2
Other	1.7	1	0.7	33.7	1.5	46.6	0	0.7	0
Total Structure Score	**26.3**	**32.7**		**38.5**	**37.4**	**27.5**	**28.2**	**30.5**	
Regenerating Stems (<5cm DBH)	0	0	0	1	1	0	1	-	-
Stem Classes (cm DBH)	10-19cm; 20-29cm;	5-9cm; 10-19cm; 20-29cm; 30-49cm	20-29cm; 30-49cm	5-9cm; 10-19cm; 20-	5-9cm; 10-19cm; 20-	10-19cm; 20-29cm;	5-9cm; 10-19cm	-	-

Site Attribute	PCT 1262 (Poor)	PCT 1235 (Melaleuca-dominated)	PCT 1235 (Poor)	PCT 1537 (Moderate)	PCT 1556 (Poor)	PCT 1525 (Poor)	PCT 1235 (dam)	PCT 1737 (Highly Degraded)	
Plot #	1	2	3	4	5	7	8	9	10
	30-49cm; 50-79cm			29cm; 30-49cm	29cm; 30-49cm; 50-79cm	30-49cm			
# Large Trees	0	0	3	5	0	0	0	-	-
Hollow-bearing Trees	1	0	0	0	2	0	0	-	-
Litter Cover (%)	48	54	11	78	19	92	0	-	-
Coarse Woody Debris (m)	0	2	0	0	0	0	0	-	-
High Threat Weed Cover	5	0.7	1.6	10.4	5	1.3	0	-	-
Total Function Score	**27.2**	**31.7**		**78.7**	**32.6**	**28.8**	**23.9**	**-**	
Overall Vegetation Integrity Score	**39.8**	**46**		**65.3**	**46.6**	**36.8**	**28.9**	**54.9**	

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.



AEP

Figure 6 - Ground-truthed Vegetation and Livistona locations | Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach | BOAMS: 00030048

Client: Addenbrooke Pty Ltd | AEP ref: 2506.03

1.4 Threatened Species

Under the BAM, threatened species are classified into two types: 'Ecosystem Credit' and 'Species Credit' type species, as detailed within the BioNet Atlas Threatened Species Profile Database (DPIE).

A predicted Ecosystem Credit Species assessment is presented in **Table 15**, a Species Credit Species assessment is presented in **Table 16**.

Field surveys were undertaken on site during November and December 2021 and January and February 2022. A summary of survey effort within the Subject Site is described in **Section 1.4** and **Appendix E**, species listed are presented in **Appendix B** and **Appendix C.**

1.4.1 Ecosystem Credit Species

Ecosystem Credit species are associated with PCTs and other habitat surrogates that are used to predict their occurrence on a particular site.

The 'biodiversity risk weighting' for a species is based on the 'sensitivity to loss' and 'sensitivity to potential gain' score using criteria listed in Appendix 7 of the BAM, and are used in credit calculations to assess impacts of the proposal on a threatened species. The sensitivity to gain class is listed within the BAM calculator for Ecosystem Credit Species. Those Ecosystem Credit Species predicted to occur within the site are provided in **Table 15**.

Table 15 – Predicted Ecosystem Credit Species

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (BioNet Atlas 2020) Y/N	Recorded within site or nearby surrounds Y/N
Anseras semipalmata	Magpie Goose	Moderate	N	N
*Anthochaera phrygia^*	Regent Honeyeater	High	N	Not mapped habitat
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Moderate	N	N
Botaurus poiciloptilus	Australasian Bittern	Moderate	N	N
*Callocephalon fimbriatum^*	Gang-gang Cockatoo	Moderate	N	N
*Calyptorhynchus lathami^*	Glossy Black-Cockatoo	High	**Y**	N
Circus assimilis	Spotted Harrier	Moderate	N	N
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	High	**Y**	N
Coracina lineata	Barred Cuckoo-shrike	Moderate	N	N
Daphoenositta chrysoptera	**Varied Sittella**	**Moderate**	**Y**	**Y**
Dasyurus maculatus	Spotted-tailed Quoll	High	N	N
Ephippiorhynchus asiaticus	Black-necked Stork	Moderate	**Y**	N

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (BioNet Atlas 2020) Y/N	Recorded within site or nearby surrounds Y/N
Epthianura albifrons	White-fronted Chat	Moderate	N	N
Glossopsitta pusilla	Little Lorikeet	High	**Y**	N
Haliaeetus leucogaster^	**White-bellied Sea-Eagle**	**High**	**Y**	**Y**
*Hieraaetus morphnoides^*	Little Eagle	Moderate	**Y**	N
Hirundapus caudacutus	**White-throated Needletail**	**High**	**Y**	**Y**
Irediparra gallinacea	Comb-crested Jacana	Moderate	N	N
Ixobrychus flavicollis	Black Bittern	Moderate	N	N
*Lathamus discolor^*	Swift Parrot	Moderate	N	Not mapped habitat
*Lophoictinia isura^*	Square-tailed Kite	Moderate	N	N
Micronomus norfolkensis	**Eastern Coastal Free-tailed Bat**	**High**	**Y**	**Y**
Miniopterus australis^	**Little Bent-winged Bat**	**High**	**Y**	**Y**
*Miniopterus orianae oceanensis^*	Large Bent-winged Bat	High	**Y**	N
Neophema pulchella	Turquoise Parrot	High	N	N
*Ninox connivens^*	Barking Owl	High	**Y**	N
Ninox strenua^	**Powerful Owl**	**High**	**Y**	**Y**
*Pandion cristatus^*	Eastern Osprey	Moderate	**Y**	N
Petroica boodang	Scarlet Robin	Moderate	**Y**	N
Pseudomys novaehollandiae	New Holland Mouse	High	N	N
Pteropus poliocephalus^	**Grey-headed Flying-fox**	**High**	**Y**	**Y**
Ptilinopus superbus	Superb Fruit-Dove	Moderate	**Y**	N
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	High	**Y**	N
Stagonopleura guttata	Diamond Firetail	Moderate	N	N
Stictonetta naevosa	Freckled Duck	Moderate	N	N
Thylogale stigmatica	Red-legged Pademelon	High	N	N

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (BioNet Atlas 2020) Y/N	Recorded within site or nearby surrounds Y/N
Tyto longimembris	Eastern Grass Owl	High	N	N
*Tyto novaehollandiae^*	Masked Owl	High	Y	N

^ Habitat surrogates relating to Ecosystem Credits relevant for foraging habitat only

The following species were excluded from the predicted ecosystem credits as they are not within mapped Important Areas for Migratory Shorebirds and suitable foraging habitat is not present on site:

- *Calidris ferruginea*
- *Calidris tenuirostris*
- *Limicola falcinellus*
- *Limosa limosa*

The following species were excluded from the predicted ecosystem credits as suitable foraging habitat is not present on site:

- *Rostratula australis*
- *Xenus cinereus*

1.4.2 Species Credit Species

In addition to the above, Species Credit Species identified within the Calculator as potentially occurring within the development site are listed below in **Table 16** with the description of preferred habitat and required survey methodology.

Table 16 – Potential Species Credit Species

Species	Biodiversity Risk Weighting (BRW)	Potential SAII	Specified Survey Period	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	AEP Survey Method	Date
Flora							
Trailing Woodruff *Asperula asthenes*	2		Oct - Dec	Known from Bulahdelah to Kempsey. A dry sclerophyll species. The distribution overlaps with the 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland' EPBC Act-listed EEC. Found in damp areas often along riverbanks.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Habitat Assessment Targeted Search Incidentals	November and December 2021
Leafless Tongue Orchid *Cryptostylis hunteriana*	2		Nov - Jan	A leafless orchid only undetectable when flowering. Does not appear to have well defined habitat preferences, known from a range of communities including swamp-heath and woodland. Associated with *Eucalyptus sclerophylla, E. sieberi, Corymbia gummifera* and *Allocasuarina littoralis*. Often occurs in association with more common *C. subulata* and *C. erecta* which can signify suitable niche habitat within a locale.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation. When local reference population is flowering	Habitat Assessment Targeted Search Incidentals	November and December 2021 January 2022
White-flowered Wax Plant *Cynanchum elegans*	2		All Year	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia subsp. integrifolia* coastal scrub; Forest Red Gum *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum *Corymbia maculata* aligned open forest and woodland; and Bracelet Honeymyrtle *Melaleuca armillaris* scrub to open scrub. Flowering occurs between August and May, with a peak in November. Flower abundance on individual plants varies from sparse to prolific. The fruit can take up to six months to mature.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Habitat Assessment Targeted Search	November and December 2021 January and February 2022
Spider orchid *Dendrobium melaleucaphilum*	2		Aug - Sep	Grows frequently on *Melaleuca styphelioides*, less commonly on rainforest trees or rocks in coastal districts. Flowers July – October.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Habitat Assessment Targeted Search	August 2022
Rough Doubletail *Diuris praecox*	1.5		All Year	Known from between Bateau Bay and Smiths Lake Grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey Exists as subterranean tubers most of the year. It produces leaves and flowering stems in winter from Jul to early Sep.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Habitat Assessment Targeted Search	August 2022
Slaty Red Gum *Eucalyptus glaucina*	2		All Year	Found only on the north coast of NSW and in separate districts near Casino where it can be locally common and farther south from Taree to Broke west of Maitland. Grows in grassy woodland and dry eucalypt forest, on deep, moderately fertile and well-watered soils.	Parallel walking transects - Maximum distance between transects 40m in open vegetation, 20m in dense vegetation. For each hectare of potential habitat average field traverse length 0.5km at 20m separation or 0.25km at 40m separation.	Habitat Assessment Targeted Search	November and December 2021, January and February 2022
Noah's False Chickweed *Lindernia alsinoides*	2		Nov - Feb	Known from Bulahdelah to Coopernook, including populations at Forster. Occurrences further north at Shannon Creek west of Coutts Crossing, also at Bungawalbyn. Grows in swamp forests and wetlands along coastal and hinterland creeks.	Parallel walking transects – Maximum distance between transects 10m in open vegetation, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 2km at 5m separation.	Habitat Assessment Targeted Search	November 2021 February 2022
Maundia triglochinoides	2		Nov - Mar	Restricted to coastal NSW and extending into southern Queensland. The current southern limit is Wyong; former sites around Sydney are now extinct. Grows in swamps, lagoons, dams, channels, creeks or shallow freshwater 30 - 60 cm deep on heavy clay, low nutrients. Flowering occurs during warmer months. Associated with wetland species e.g., *Triglochin procerum*. Probably wind pollinated. Diaspore is the seed and root tubers, which are probably dispersed by water. Spreads vegetatively, with tufts of leaves arising along rhizome. Populations expand following flood events and contract to more permanent wetlands in times of low rainfall. Flowers November-January.	Targeted survey in suitable habitat including damp places, especially beside streams and lakes. For each hectare of potential habitat average field traverse length 1km at 10m separation or 2km at 5m separation.	Habitat Assessment Targeted Search	November and December 2021, January and February 2022
Biconvex Paperbark	2		All year	Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation	Habitat Assessment Targeted Search	November and December 2021,

Species	Biodiversity Risk Weighting (BRW)	Potential SAII	Specified Survey Period	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	AEP Survey Method	Date
Melaleuca biconvexa				slopes or sheltered aspects. Flowering occurs over just 3-4 weeks in September and October. Resprouts following fire.	For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation		January and February 2022
Grove's Paperbark *Melaleuca groveana*	2		All Year	Grove's Paperbark grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcopping granite, rhyolite and sandstone on rocky outcrops and cliffs. It also occurs in dry shrubby open forest and woodlands.	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation	Habitat Assessment Targeted Search	November and December 2021, January and February 2022
Tall Knotweed *Persicaria elatior*	2		Dec - May	Species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. Survey: Sometimes this species dies off above ground off in winter, but in other situations can persist through winter. It can be identified from its leaves without flowers. References: RMS surveys.	Targeted survey in suitable habitat including damp places, especially beside streams and lakes. For each hectare of potential habitat average field traverse length 1km at 10m separation or 2km at 5m separation.	Habitat Assessment Targeted Search	December 2021, January and February 2022
Pomaderris queenslandica Scant Pomaderris	2		All Year	Widely scattered but not common in north-east NSW and in Queensland. It is known from several locations on the NSW north coast and a few locations on the New England Tablelands and North West Slopes, including near Torrington and Coolata. Found in moist eucalypt forest or sheltered woodlands with a shrubby understorey, and occasionally along creeks.	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation	Habitat Assessment Targeted Search	November and December 2021, January and February 2022
Eastern Australian Underground Orchid *Rhizanthella slateri*	3	Y	Sept - Nov	Highly cryptic - grows almost completely below the soil surface, with fleshy flower heads which may mature below the surface or extend no more than 20mm, and usually located only when the soil is disturbed. Grows in sclerophyll forest in shallow to deep loams. Recorded Blue Mtns, Bulahdelah & Dharug NP.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation	Habitat Assessment Targeted Search	November 2021
Scrub Turpentine *Rhodamnia rubescens*	3	Y (see SAII Assessment **2.5.1**)	All Year	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. This species is characterised as highly to extremely susceptible to infection by Myrtle Rust. Myrtle Rust affects all plant parts.	Parallel walking transects – Maximum distance between transects 15m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.75km at 15m separation	Habitat Assessment Targeted Search	November and December 2021, January, February and July 2022
Native Guava *Rhodomyrtus psidioides*	3	Y	All year	Currently known from a few localised occurrences in the area bounded by the towns of Wyong, Warnervale and Wyongah on the New South Wales Central Coast, within the Wyong Local Government Area. Occurs from 10-40 m a.s.l. in grassy woodland or occasionally derived grassland in well-drained clay loam or shale derived soils. The vegetation type in which the majority of populations occur (including the largest colony) is a *Spotted Gum - Ironbark Forest* with a diverse grassy understorey and occasional scattered shrubs. A number of sites where the species occurs are subject to past and ongoing disturbance, including sites on the edges of roads that contain a mixture of native and introduced species in the understorey, though competition with invasive introduced species is a threat.	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation. When local reference population is flowering.	Habitat Assessment Targeted Search	November and December 2021, January and February 2022
Rainforest Cassia *Senna acclinis*	2		All Year	Occurs in coastal districts and adjacent tablelands of NSW from the Illawarra in NSW to Queensland. Grows on the margins of subtropical, littoral and dry rainforests. Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.5km at 20m separation	Habitat Assessment Targeted Search	November and December 2021, January and February 2022
Magenta Lilly Pilly *Syzygium paniculatum*	2		Apr - Jun	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities.	Use fruit to identify. Naturally occurring plants generally produce low numbers of fruit, while cultivated individuals and offspring generally produce high numbers of fruit. Parallel walking transects – Maximum distance between transects 15m in open, 10m in dense vegetation.	Habitat Assessment Targeted Search	November 2021 January 2022 February 2022 July 2022

Species	Biodiversity Risk Weighting (BRW)	Potential SAII	Specified Survey Period	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	AEP Survey Method	Date
					For each hectare of potential habitat average field traverse length 1km at 10m separation or 0.75km at 15m separation.		
Zannichellia palustris	2		Oct - Jan	Grows in fresh or slightly saline stationary or slowly flowing water. Flowers during warmer months. NSW populations behave as annuals, dying back completely every summer.	Targeted survey in suitable habitat – waterbodies.	Targeted Search	December 2021 January 2022
Fauna							
Bush Stone-curlew *Burhinus grallarius*	2		All Year	The species has a strong preference for habitats with extensive fallen/standing dead timber including logs. The species is mainly found in western slopes and plains and the Riverina, smaller numbers on Central and North Coast with increasing numbers in Tweed Valley. It may be easier to detect during breeding season, possibly calls all year, but it is unclear how well it responds to playback. The species was allocated to a species credit as experts determined that it cannot be predicted to occur at a site based on vegetation surrogates but can be detected reliably from survey.	Diurnal bird census – Flushing by walking through potential habitat. Spotlighting by foot or from a vehicle driven in first gear. Call playback - Sites for Bush Stone-curlew surveys should be 2-4km apart and conducted during the breeding season.	Songmeter Diurnal Bird Census Nocturnal surveys and spotlighting on foot. Incidental surveys conducted	January and February 2020. November 2021 February 2022 September and November 2020. January and February 2022
Eastern Pygmy-possum *Cercartetus nanus*	2		Oct - Mar	The species can be found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Also feeds on insects throughout the year; this feed source may be more important in habitats where flowers are less abundant such as wet forests. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum (Pseudocheirus peregrinus) drays or thickets of vegetation, (e.g., grass-tree skirts); nest-building appears to be restricted to breeding females; tree hollows are favoured but spherical nests have been found under the bark of eucalypts and in shredded bark in tree forks. Appear to be mainly solitary, each individual using several nests, with males having non-exclusive home-ranges of about 0.68 hectares and females about 0.35 hectares. Young can be born whenever food sources are available, however most births occur between late spring and early autumn.	The minimum survey effort for site under 100ha should be 2 per vegetation community or habitat type for 14 consecutive nights. Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Habitat assessment Nocturnal surveys and spotlighting on foot Camera trapping	November and December 2021 Noc – February 2022 Camera Jan 2022
Wallum Froglet *Crinia tinnula*	1.5		All Year	Wallum Froglets are found in a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. The species breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches. Breeding is thought to peak in the colder months, but can occur throughout the year following rain. Wallum Froglets shelter under leaf litter, vegetation, other debris or in burrows of other species. Shelter sites are wet or very damp and often located near the water's edge. Males may call throughout the year and at any time of day, peaking following rain.	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Nocturnal surveys and spotlighting on foot Searches after rain conducted in November (16.8mm of rainfall at Taree Airport over 72hrs) and December (11.4mm of rainfall at Taree Airport over 72hrs)	November and December 2021
Emu population in the NSW North Coast Bioregion and Port Stephens LGA *Dromaius novaehollandiae*	2		All year	In the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest.	Diurnal bird census – Flushing by walking through potential habitat.	Songmeter Diurnal Bird Census Nocturnal surveys and spotlighting on foot. Incidental surveys	January and February 2020. November 2021 February 2022 September and November 2020. January and February 2022

Species	Biodiversity Risk Weighting (BRW)	Potential SAII	Specified Survey Period	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	AEP Survey Method	Date
White-bellied Sea-Eagle *Haliaeetus leucogaster*	2		Jul - Dec	Terrestrial habitat includes coastal dunes, tidal flats, grassland, heathland, woodland and forest. Requires large emergent eucalypts for nesting. Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	Area based survey methods. Habitat assessment – 30 minutes searching each relevant habitat.	Diurnal Bird Census Habitat Assessment Incidental surveys	November 2021 November and December 2021 November to February 2022
Little Eagle *Hieraaetus morphnoides*	1.5		Aug - Oct	Little Eagle are a dual credit species. Foraging habitat is considered an ecosystem credit and breeding is considered a species credit. The species nest in live (occasionally dead) large old trees within vegetation. Paddock trees can provide important breeding habitat (there are examples of nest trees in ACT). Breeding habitat is live (occasionally dead) large old trees within suitable vegetation AND 1. the presence of a male and female; or 2. female with nesting material; or 3. an individual on a large stick nest in the top half of the tree canopy. Where a breeding site has been identified in accordance with the BAM the species polygon should be established by providing a circular buffer of 300m around the nest tree. The purpose of the buffer is to minimise disturbance/avoid clearing, for a development application, or to conserve and improve habitat, for a biodiversity stewardship agreement, within the area essential for breeding. This includes habitat suitable for feeding/grooming perches and fledgling requirements. It does not account for foraging habitat. Little Eagles are less likely than urban-adapted raptors to readily cross urban or peri-urban spaces to hunt. The 300m buffer is in accordance with the ACT offset guidelines for this species.	Habitat assessment – 30 minutes searching each relevant habitat.	Diurnal Bird Census Habitat Assessment Incidental surveys	November 2021 November and December 2021 November to February 2022
Pale-headed Snake *Hoplocephalus bitorquatus*	2		Nov- Mar	Utilises hollows within 500m of sandstone escarpments during summer though gravid females remain near cliffs during the summer. Best surveyed at night by searching areas of rocky sheltering sites close to sandstone escarpments.	Survey in dry weather only to minimise damage to sandstone, must not be too warm. As temperatures increase the species moves to utilising hollows in trees, often in sandstone gullies downslope of outcrops.	Nocturnal surveys and spotlighting on foot	November and December 2021
Green and Golden Bell Frog *Litoria aurea*	2		Nov - Mar	Habitat for the species includes semipermanent/ephemeral wet areas, within 1km of swamps, waterbodies or wet areas. In high altitude populations calling seasons are restricted to summer months. While chytrid is a potential threat to some populations of the species, other populations are subject to manageable threats. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.). Some sites, particularly in the Greater Sydney region occur in highly disturbed areas.	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Nocturnal surveys and spotlighting on foot Searches after rain conducted in November (16.8mm of rainfall at Taree Airport over 72hrs) and December (11.4mm of rainfall at Taree Airport over 72hrs)	November and December 2021
Green-thighed Frog *Litoria brevipalmata*	1.5		Oct - Mar	The species was allocated to species credit species because presence cannot be predicted from vegetation or landscape surrogates. Experts noted that it is difficult to detect from survey, detection could be optimised by detailed/strict survey guidelines. Survey: reliant on rainfall events for calling/breeding when it is usually detected/surveyed, strongly suggest >75 mm in 24 hrs or 150 mm over 72 hrs as the most probable time to survey and detect the species. Note that tadpole's susceptible to injury during netting, they can be identified from observation. Whilst there is some information on the species ecology little is known about the species response to management. A ground-dwelling frog that inhabits coastal forest and bushland. Calling males gather around temporary or semi-permanent ponds and flooded ditches after heavy rain. Egg masses are often laid in temporary ponds. Tadpoles are predominately surface dwellers, but feed throughout the water body.	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Nocturnal surveys and spotlighting on foot Searches after rain conducted in November (16.8mm of rainfall at Taree Airport over 72hrs) and December (11.4mm of rainfall at Taree Airport over 72hrs)	November and December 2021
Square-tailed Kite *Lophoictinia isura*	1.5		Sep - Jan	Found in a variety of timbered habitats including dry woodlands and open forests. Nesting sites generally located along or near water courses, in a fork or on large horizontal limbs. The species is allocated to dual credit because they tend to be sensitive to disturbance around nests. It will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also	Habitat assessment – 30 minutes searching each relevant habitat.	Diurnal Bird Census Habitat Assessment Incidental surveys	November 2021 November and December 2020

Species	Biodiversity Risk Weighting (BRW)	Potential SAII	Specified Survey Period	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	AEP Survey Method	Date
				be nesting where Kites might be recorded. Kites will need to be in attendance to confirm breeding sites.			November 2021 to February 2022
Giant Barred Frog *Mixophyes iteratus*	2		Oct - Mar	Habitat Constraint: Land within 50m of semipermanent and permanent drainages. Survey: shoulder periods of April and September should be accompanied by rainfall within 5 days with the event exceeding greater than 5 mm in 24 hrs. The species was in decline but it appears to have recovered to some degree and management actions are relatively well defined. Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor. However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams.	Combination of tadpole surveys, call surveys and nocturnal searches along flowing streams in suitable weather conditions. Minimum of one 200-metre transect per stream repeated on a minimum of two separate nights. This species may respond to call playback or a good imitation of their call.	Nocturnal surveys and spotlighting on foot Searches after rain conducted in November (16.8mm of rainfall at Taree Airport over 72hrs) and December (11.4mm of rainfall at Taree Airport over 72hrs)	November and December 2021
Southern Myotis *Myotis macropus*	2		Oct -- Mar	The habitat constraint for Southern Myotis is hollow bearing trees within 200m of riparian zone. The species was allocated to species credit because it is dependent on waterways with pools of 3m wide or greater for foraging (which will be protected under legislation), habitat surrounding waterways is used for breeding and roosting. The species can be detected via survey using appropriate techniques (see Threatened Bat Survey Guide). Constraints based on information from Campbell Susan (2009). All habitat on the subject land where the subject land is within 200m of a waterbody with pools/ stretches 3m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies on the subject land must be mapped. Use aerial imagery to map waterbodies with pools/ stretches 3m or wider on or within 200m of the subject land. Species polygon boundaries should align with PCTs on the subject land to which the species is associated that are within 200m of waterbodies mapped.	Minimum four hours of recording immediately after dusk, with whole night recording recommended, ultrasonic recorders located in areas of greatest potential activity A minimum of four nights survey and 16 nights total survey effort per <2.5km riparian length with acoustic recorders. Roost search: Potential breeding habitat searched for bat or bat sign using a torch. If detected, trapping may be necessary to identify species and/or breeding status.	Habitat assessment Anabat recording	November and December 2021 January and February 2022
Eastern Osprey *Pandion cristatus*	1.5		Apr - Nov	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	Area based survey methods. Habitat assessment – 30 minutes searching each relevant habitat.	Diurnal Bird Census Habitat Assessment	November 2021 November and December 2020
Giant Dragonfly *Petalura gigantea*	2	Y	Dec - Jan	Live in permanent swamps and bogs with some free water and open vegetation. Adults emerge from late October and are short-lived, surviving for one summer after emergence. Adults spend most of their time settled on low vegetation on or adjacent to the swamp. They hunt for flying insects over the swamp and along its margins.	Survey Drainage Lines, Dams, Ponds, Wet Areas and Suitable Habitat. Walk perimeter of Drainage lines and Dams, Watch dams for Giant Dragonfly. Check Aquatic reeds and banks for Giant Dragonfly Habitat.	Habitat Assessment Targeted searches Incidentals	December 2020 January 2022
Squirrel Glider *Petaurus norfolcensis*	2		All Year	Inhabits Blackbutt-Bloodwood Forest with heath understorey in coastal areas. Lives in family groups. Requires abundant tree hollows for refuge and nesting. Survey year round but sites with bi-pinnate acacia, autumn winter flowering trees and shrubs such as *Eucalyptus robusta* and Banksia sp. (integrifolia etc.) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e., no more than 50 m apart). Important known food plants – *Eucalyptus siderophloia/tereticornis/pilularis/robusta*, *Corymbia maculata/gummifera*, *Melaleuca quinquenervia*, *Acacia irrorata/longifolia*, *Banksia spp*.	Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights. Stagwatching - Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset	Nocturnal surveys and spotlighting on foot. Songmeter Camera trapping for 25 nights.	November and December 2021 January and February 2022 January 2022
Brush-tailed Phascogale *Phascogale tapoatafa*	2		Dec - Jun	The species preferred habitat includes hollow logs, under bark, rocks, cracks in soil, grass tussocks or building debris. The species prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter; however, they can also inhabit heath, swamps, rainforest and wet sclerophyll forest. Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater. They feed mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. Females have exclusive territories of approximately 20 - 40 ha, while males have overlapping territories often greater than 100 ha. They nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and can use many different hollows over a short time span. Mating occurs May – July.	While the DECC 2004 guidelines do not make reference to camera trapping, the technique has been previously acknowledged as a suitable mammal survey method (S. Lewer pers. comm.). Reference to the Wyong Shire Council Flora & Fauna Survey guidelines, Table 3 indicates for all mammals that remote camera survey technique is preferred over trapping. The minimum survey effort for site	Nocturnal surveys and spotlighting on foot. Songmeter Camera trapping for 25 nights.	November and December 2021 January 2022

Species	Biodiversity Risk Weighting (BRW)	Potential SAII	Specified Survey Period	Habitat Requirements / Habitats Searched / General Notes	Survey Guidelines	AEP Survey Method	Date
					under 100ha should be 2 per vegetation community or habitat type for 14 consecutive nights. Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.		
Koala *Phascolarctos cinereus*	2		All Year	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.	Call playback - 2 sites per stratification unit up to 200 hectares, plus an additional site per 100 hectares above 200 hectares. Each playback site must have the session conducted twice, on separate nights. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights. Habitat assessment - 30 minutes searching each relevant habitat, including trees for scratch marks.	Habitat assessment Songmeter Camera trapping for 25 nights. Nocturnal surveys and spotlighting on foot. SAT survey	November and December 2021 January and February 2022
Common Planigale *Planigale maculata*	2		All Year	Inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks.	Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Camera trapping for Camera trapping for 25 nights. Nocturnal surveys and spotlighting on foot.	November and December 2021 January and February 2022
Red-backed Button-quail *Turnix maculosus*	2		All Year	Over their Australian range, Red-backed Button-quail inhabit grasslands, open and savannah woodlands with grassy ground layer, pastures and crops of warm temperate areas, typically only in regions subject to annual summer rainfall greater than 400 mm. In NSW, said to occur in grasslands, heath and crops. Said to prefer sites close to water, especially when breeding. The species has been observed associated with the following grasses (in various vegetation formations): speargrass Heteropogon, Blady Grass *Imperata cylindrica*, Triodia, Sorghum, and Buffalo Grass *Cenchrus ciliaris*. Observations of populations in other parts of its range suggest the species prefers sites near water, including grasslands and sedgelands near creeks, swamps and springs, and wetlands.		Habitat assessment Nocturnal surveys and spotlighting on foot Incidentals	November and December 2021 January and February 2022
Mahony's Toadlet *Uperoleia mahonyi*	2		Oct - Mar	Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Recent studies suggest intact vegetation adjacent to and within water bodies is an important habitat feature for this species. Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. Aquatic vegetation at breeding sites includes sedges (*Schoenoplectus* spp., *Baumea* spp. and *Lepyrodia articulata*) and Broadleaf Cumbungi (*Typha orientalis*). Females have been recorded up to 400m from water-bodies indicating moderate dispersal distances and use of multiple habitat types. Tadpoles have been observed using leaf litter in the shallow verges of water bodies on sandy substrate. Rocks, logs and leaf litter may also be used for shelter and provide important foraging areas for invertebrate prey items.	Systematic day habitat search – one hour per stratification unit. Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	Nocturnal surveys and spotlighting on foot Searches after rain conducted in November (16.8mm of rainfall at Taree Airport over 72hrs) and December (11.4mm of rainfall at Taree Airport over 72hrs)	November and December 2021

The following candidate threatened species did not require further consideration and were ruled out of the above list as habitat or location constraints were not met:

- Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Anthochaera phrygia*): The Subject Site is not mapped as Important Areas for Swift Parrot Habitat or Regent Honeyeater Habitat. Important Areas maps are included in **Appendix D**.
- *Petrogale pencillata* (Brush-tailed Rock-wallaby): The Subject Site does not contain and is not within 1km of land with rocky escarpments, gorges, steep slopes, boulder piles or clifflines.
- *Diuris flavescens* (Yellow Doubletail): This species has been discounted for geographical and habitat restriction. As a species, the southern-most known population is in the Taree South area. Council has advised that *D. flavescens* is not expected to be present on the Subject Site.
- *Tetratheca juncea* (Black-eyed Susan): This species has been discounted for geographical restriction. As a species, the northern-most known population is in the Bulahdelah region. Council has advised that *T. juncea* is not expected to be present on the Subject Site.
- Gang-gang Cockatoo (*Callocephalon fimbriatum*) and Glossy Black-Cockatoo (*Calyptorhynchus lathami*): These species have been discounted due to a lack of suitable hollow-bearing trees within the Subject Site. There are no BioNet records within the 10km search extent for Gang-gang Cockatoo.
- Migratory shorebirds (*Calidris ferruginea, Calidris tenuirostris, Limicola falcinellus, Limosa limosa*): The Subject Site is not mapped as Important Areas for migratory shorebirds. Important Areas maps are included in **Appendix D**.
- Forest owls (*Ninox connivens, Ninox strenua, Tyto novaehollandiae*): These species were discounted to breeding habitat constraint – no hollow-bearing trees were observed on the Subject Site.
- Microbats (*Chalinolobus dwyeri*, *Miniopterus australis, Miniopterus orianae oceanensis, Vespadelus troughtoni*): These species were discounted due to breeding habitat constraint – there are no caves or rocky outcrops within the Subject Site or with 2km of the Subject Site.

1.4.3 Field Survey Methods

Surveys are deemed to fulfill minimum survey requirement. Details of the flora and fauna survey are presented in **Table 16** and were conducted using relevant guidelines, in particular: DPIE survey guidelines for threatened plants (2020) and amphibians (2020), along with applicable EPBC guidelines (2010; 2011). Diurnal Survey Effort is shown in **Figure 7** and Nocturnal Survey Effort is shown in **Figure 8**.

Field sheets are provided in **Appendix D**, and flora and fauna species list for those species recorded during field surveys are provided in **Appendix B** and **Appendix C**.

1.4.3.1 Habitat Features Surveys

An assessment of the relative habitat values present within the Subject Site was undertaken. This assessment focused primarily on the identification of specific habitat types and resources within the Study Area favoured by known threatened species listed in **Section 1.4.2**. The assessment also considered the potential value of the Subject Site (and surrounding areas) for all major guilds of native flora and fauna. The assessment was based on the specific habitat requirements of each threatened

fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements.

Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages. In particular, focus was put on documenting the presence of key habitat features such as tree hollows. Hollows are an important resource utilised by a variety of forest fauna, and are particularly relevant for several of the likely key threatened species in this locality.

1.4.3.2 Flora Field Survey

All required flora survey techniques were utilised for targeted survey of the species listed in **Tables 15** and **16** above and guided by the *Threatened Species Survey and Assessment Guidelines* (2004) and the BAM (2020).

The following survey methods were undertaken to record the presence of threatened species on site:

- Ground-truthing of regional vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices.
- Identification of all vascular plant species encountered during fieldwork. Subject Site coverage was both systematic to ensure all key points of the site were checked, and therein the Random Meander Technique (Cropper 1993) was utilised to maximise species encountered.
- Seasonal threatened flora surveys.
- Ten (10) BAM plots were undertaken in accordance with BAM 2020.
- Eight (8) Rapid Data Points (RDPs) were undertaken in the retained lands.
- Updated/Refined Vegetation Community Mapping involving traversal over the entire Study Area, concentrating particularly on mapping the boundaries between the identified Plant Community Types of the BAM 2020 and refining the original mapping.

Due to the highly disturbed nature of the site, parallel transects were deemed not appropriate. Areas of suitable native vegetation were examined by ecologists in the field, including the area within the dripline of paddock trees and patches of native vegetation that lacked canopy.

Table 15 shows the results of the surveys for the listed flora species.

1.4.3.3 Fauna Field Surveys

All required fauna survey techniques were utilised for targeted survey of the species listed in **Table 16** above and guided by the *Threatened Species Survey and Assessment Guidelines* (2004) and *Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians* (2020).

1.4.3.4 Incidental Observations

Incidental records of any fauna species observed during fieldwork were noted. This included opportunistic sightings of secondary indications (scratches, scats, diggings, tracks, etc.) of any resident or migratory species. Searches were also conducted for whitewash, regurgitation pellets and prey remain from Owls, chewed Casuarina cones from Black-Cockatoos, chewed fruit remains from frugivorous birds, etc.

These surveys are deemed to fulfill minimum survey requirement. Details of the flora and fauna survey are presented in **Table 16** and was conducted using relevant guidelines, in particular DPIE survey guidelines for threatened plants (2020) and amphibians (2020), along with applicable EPBC guidelines (2010; 2011).

Field sheets are provided in **Appendix F**, and flora and fauna species list for those species recorded during field surveys are provided in **Appendix B** and **Appendix C.**

1.4.4 Survey Effort Results

1.4.4.1 Habitat Trees

No Hollow-Bearing Trees (HBTs) were observed within the Subject Site, likely due to the age and condition of the trees. Despite thorough surveying, very small hollows may also have gone unnoticed that would be suitable for small species such as microbats. Others may have gone unobserved due to the height and orientation of potential hollows.

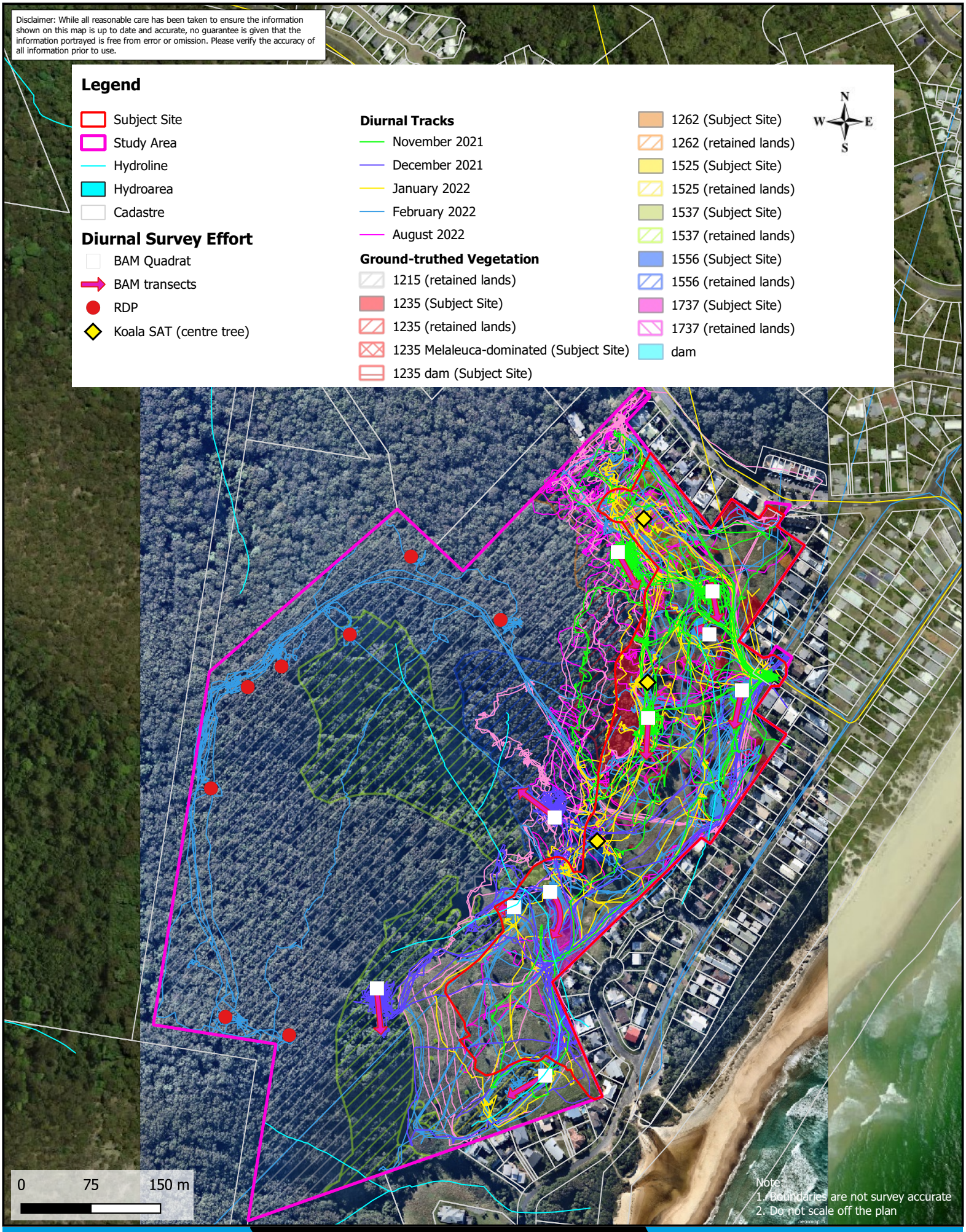
1.4.4.2 Water Features

Several dams and drainage lines are present within the Subject Site that may represent potential habitat for amphibians and water birds as well as potential foraging habitat for *Myotis macropus.* Some of the dams are partially vegetated with macrophytes.

Drainage lines on site do not entirely match the MidCoast Hydroline mapping layer. A manufactured swale with a distinct channel that is not mapped runs around the edge of the Subject Site in the south where it bounds with Lots 6 and 7 DP 245303. No riparian assessment has be conducted.

1.4.4.3 Other habitat features

The Subject Site also possesses other habitat features including piles of timber that provide potential habitat for reptiles, amphibians and small mammals.



AEP

Figure 7 - Diurnal Survey Effort

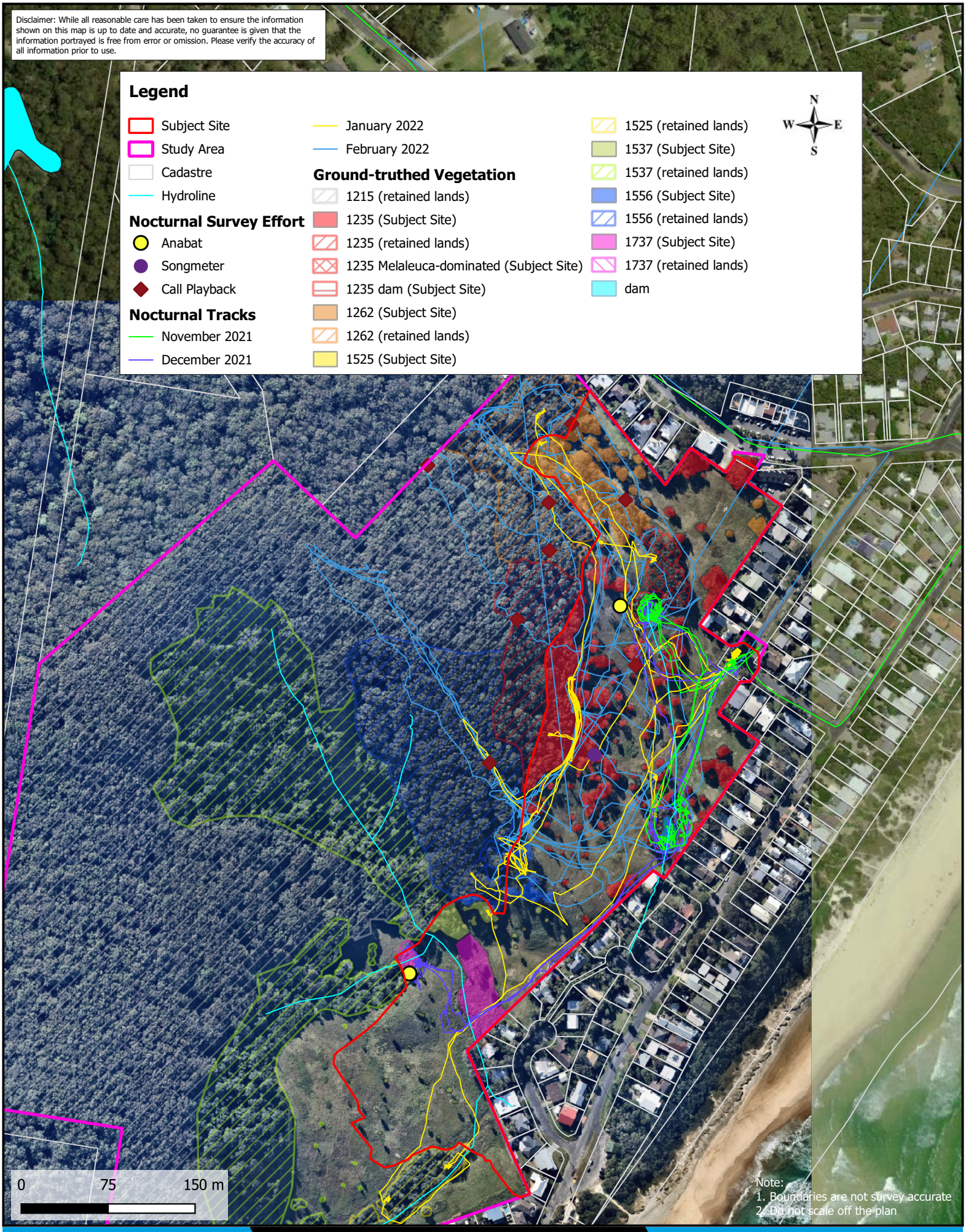
Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 00030048

Client: Addenbrooke Pty Ltd

AEP ref: 2506.03



AEP

Figure 8 - Nocturnal Survey Effort

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 00030048

Client: Addenbrooke Pty Ltd

AEP ref: 2506.03

1.4.5 Species Credit Species Survey Results

Overall survey effort within the site (for plots, targeted searches and habitat assessments) and within the Subject Site (from past surveys, including plots, targeted searches, habitat assessments, camera traps and Anabat detectors) are detailed in **Table 17** and **Appendix E**, and was conducted using relevant guidelines, in particular OEH survey guidelines for plants (2016) and amphibians (2020), along with applicable EPBC guidelines (2010; 2011). Diurnal Survey Effort is shown in **Figure 7** and Nocturnal Survey Effort is shown in **Figure 8**.

All candidate species as identified in **Table 16** were included for presence analysis based on targeted surveys. Species credit species are assessed for potential to occur, details of methodologies are found in **Table 16** and results detailed in **Table 17**.

Table 17 – Species Credit Species

Species	Survey Technique Adhere to Guidelines in Table 16 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Geographical Restrictions (Y/N)	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Flora									
Trailing Woodruff *Asperula asthenes*	Y	Y	0	N	The species was not detected during surveys. Targeted surveys of suitable habitat observed that habitat is highly disturbed and degraded. There are no known records of this species within 10km of the Subject Site. It is unlikely that this species is present in the Study Area.	N/A	N	N	N
Leafless Tongue Orchid *Cryptostylis hunteriana*	Y	Y	0	N	The species was not detected during surveys. There are many constraints within the Subject Site that restrict and / or prohibit this species from the site such as mostly cleared and underscrubbed vegetation previously grazed by cattle and high incidence of non-native species. There are no records of this species within 10km of the Subject Site.	N/A	N	N	N
Rough Doubletail *Diuris praecox*	Y	N	0	Y. Within the parish boundaries of Forster, Eurunderee, Fens, Tomaree, Stowell and Stockton	There are many constraints within the Subject Site that restrict and / or prohibit this species from the site such as mostly cleared and underscrubbed vegetation grazed by cattle and high incidence of exotic species. There are no records of this species within 10km of the Subject Site.	N/A	N	N	N
Slaty Red Gum *Eucalyptus glaucina*	Y	Y	0	N	The species was not detected during targeted surveys. There are no known records of this species within 10km of the Subject Site. It is unlikely that this species is present in the Study Area.	N/A	N	N	N
Small-flower Grevillea *Grevillea parviflora subsp. parviflora*	Y	Y	0	N	The species was not detected during targeted surveys. There are no known records of this species within 10km of the Subject Site. It is unlikely that this species is present in the Study Area.	N/A	N	N	N
Noah's False Chickweed *Lindernia alsinoides*	Y	Y	89	N	The species was not detected during surveys. Targeted surveys of suitable habitat observed that habitat is highly disturbed and degraded. BioNet records are more than 1.5km away from the Subject Site, and located in areas protected from coastal salt air. It is unlikely that this species is present in the Study Area.	N/A	N	N	N
Maundia triglochinoides	Y	Y	0	N	The species was not detected during surveys. Targeted surveys of suitable habitat observed that habitat is highly disturbed and degraded. There are no known records of this species within 10km of the Subject Site. It is unlikely that this species is present in the Study Area.	N/A	N	N	N
Biconvex Paperbark	Y	Y	0	N	The species was not detected during targeted surveys. There are no known records of this species within 10km of the Subject Site. It is unlikely that this species is present in the Study Area.	N/A	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 16 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Geographical Restrictions (Y/N)	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Melaleuca biconvexa									
Grove's Paperbark *Melaleuca groveana*	Y	Y	0	N	The species was not detected during targeted surveys. There are no known records of this species within 10km of the Subject Site. It is unlikely that this species is present in the Study Area.	N/A	N	N	N
Tall Knotweed *Persicaria elatior*	Y	Y	0	N	The species was not detected during surveys. Targeted surveys of suitable habitat observed that habitat is highly disturbed and degraded. *Persicaria* spp. on site were observed and determined to not be *P. elatior*. There are no known records of this species within 10km of the Subject Site. It is unlikely that this species is present in the Study Area.	N/A	N	N	N
Eastern Australian Underground Orchid *Rhizanthella slateri*	Y	Y	0	N	The species was not detected during surveys. There are many constraints within the Subject Site that restrict and / or prohibit this species from the site such as mostly cleared and underscrubbed vegetation grazed by cattle and high incidence of exotic species. There are no records of this species within 10km of the Subject Site.	N/A	N	N	N
Scrub Turpentine *Rhodamnia rubescens*	Y	Y	20	N	This species was observed as a single specimen on the Subject Site. The wider Study Area contains more than 20 additional specimens. The specimen on the Subject Site is in very poor condition, with a high level of myrtle rust. It is located at the base of a semi-mature *Eucalyptus canaliculata* and is being impacted by edge effects and the coastal salt air. It is unlikely to be viable even without development impacts. A discussion of mitigation measures is included in **Section 2.2**.	N/A	**Y**	**Y**	**Y**
Native Guava *Rhodomyrtus psidioides*	Y	Y	7	N	The species was not detected during targeted surveys. There is potential habitat for the species to be on site, however, the most suitable habitat is located west of the Subject Site within the higher quality vegetation. Habitat on site is degraded and impacts to site vegetation are unlikely to be significant for this species.	N/A	N	N	N
Senna acclinis Rainforest Cassia	Y	Y	1	N	Species was not observed during targeted surveys. All *Senna* spp. observed on site were determined to be *Senna pendula*. There is potential habitat for the species to be on site, however, the most suitable habitat is located west of the Subject Site within the higher quality vegetation. Habitat on site is degraded and impacts to site vegetation are unlikely to be significant for this species.	N/A	N	N	N
Syzigium paniculatum Magenta Lilly Pilly	Y	Y	63	N	Species not observed during surveys undertaken outside the recommended survey time. Examination of Syzygium spp. on site determined presence only of *Syzygium oleosum,* which was observed fruiting on site in August 2022. Habitat on site is degraded and impacts to site vegetation are unlikely to be significant for this species.	N/A	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 16 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Geographical Restrictions (Y/N)	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Fauna									
Bush Stone-curlew *Burhinus grallarius*	Y	Y	0	N	Species was not observed during diurnal bird and nocturnal surveys. High levels of clearing and underscrubbing reduces likelihood of species presence. There are no records of this species within 10km of the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N
Eastern Pygmy-possum *Cercartetus nanus*	Y	Y	0	N	Adequate hollow-bearing trees are absent on the Subject Site. Species was not observed during surveys however may utilise the subject site for foraging. There are no records of this species within 10km of the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N
Wallum Froglet *Crinia tinnula*	Y	Y	5	N	Species was not observed during frog surveys conducted after rain. Site lacks preferred wallum habitat. The most recent records, from 2020, are located in Myall Lakes National Park and Tarbuck Bay. The closest record, less than 1km away, is dated from 1999, making it over 20 years old. It is considered unlikely that this species will be present.	N	N	N	N
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Y	Y	104	N	Species was observed flying over site from coastal area towards the ridgeline in the west of the Study Area. No nests or potential nesting trees were sighted within the Subject Site. This species likely utilises the area for foraging however there is no evidence of breeding at the Subject Site. A known nest tree is present several kilometres to the west of the Subject Site.	N	Y	Y	N
Little Eagle *Hieraaetus morphnoides*	Y	N	5	N	Species was not observed during surveys. No nests or potential nesting trees were sighted within the Subject Site. This species could potentially utilise the area for foraging however there is no evidence of breeding at the Subject Site.	N	N	N	N
Pale-headed Snake *Hoplocephalus bitorquatus*	Y	Y	0	N	Species was not observed during nocturnal surveys. There are no records of this species within 10km of the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N
Stephen's Banded Snake *Hoplocephalus stephensii*	Y	Y	6	N	A 2009 record of a dead juvenile is present at the northern edge of the Subject Site at Boomerang Drive. Another dead juvenile was observed in 2007 at Boomerang Drive to the east of the Subject Site. The latest record in the vicinity if from 2019 in Booti Booti National Park. Species was not observed during nocturnal surveys. Given the degraded condition of suitable habitat on the Subject Site, and presence of more suitable habitat offsite, it is unlikely that this species is present on site.	N	Y (Bionet Record)	Y (Bionet Record)	N
Green and Golden Bell Frog *Litoria aurea*	Y	Y	1	N	Species was not observed during frog surveys conducted after rain. A single record of this species is present from 1996 in Myall Lakes National Park, around 5km from the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N
Green-thighed Frog	Y	Y	6	N	Species was not observed during frog surveys conducted after rain. Records are located more than 5km from the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 16 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Geographical Restrictions (Y/N)	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Litoria brevipalmata									
Square-tailed Kite *Lophoictinia isura*	Y	Y	1	N	While several water bodies exist on the site, there is a lack of suitable aquatic vegetation thus the site is not suitable for breeding. The Subject Site experiences slashing with a moderate to heavy weed presence. Important habitat for this species is absent. No nests were observed, and only a single record is present approximately 2km to the west. It is considered unlikely that this species will be present.	N	N	N	N
Giant Barred Frog *Mixophyes iteratus*	Y	Y	0	N	Species was not observed during targeted frog surveys. There are no records of this species within 10km of the Subject Site.	N	N	N	N
Southern Myotis *Myotis macropus*	Y	Y	0	N	Species potentially recorded by Anabat on Subject Site (analysis identified to species group). Suitable foraging habitat present on site. There are no records of this species within 10km of the Subject Site.	It is impossible to distinguish this species from a group of calls via acoustic detection equipment. This group of calls was detected during Anabat deployment.	It is impossible to distinguish this species from a group of calls via acoustic detection equipment. This group of calls was detected during Anabat deployment.	It is impossible to distinguish this species from a group of calls via acoustic detection equipment. This group of calls was detected during Anabat deployment.	N
Eastern Osprey *Pandion cristatus*	Y	Y	11	N	Species was not observed during surveys. This species is considered sensitive to disturbance and pollution, considering the level of degradation, including weed presence, past grazing and trampling by cattle around water bodies, and this site may be too disturbed for this species.	N	N	N	N
Giant Dragonfly *Petalura gigantea*	Y	Y	0	N	Species was not observed during targeted surveys. There are no records of this species within 10km of the Subject Site.	N	N	N	N
Squirrel Glider *Petaurus norfolcensis*	Y	Y	6	N	Adequate hollow-bearing trees are absent on the Subject Site. Species was not observed during surveys. The latest record dates from 2020 and is located in Whoota, over 4km from the Subject Site. The closest record, less than 2km from site, is dated from 1993. It is considered unlikely that this species will be present.	N	N	N	N
Brush-tailed Phascogale *Phascogale tapoatafa*	Y	Y	3	N	Adequate hollow-bearing trees are absent on the Subject Site. Species was not observed during surveys. Records are from 1997 and 2019, and located over 3km away from the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N
Koala	Y	Y	85	N	Koala Use Trees are present on site. See full assessment in **Appendix I**.	N	N	N	N

Species	Survey Technique Adhere to Guidelines in Table 16 (Y/N)	Surveyed in Season (Y/N)	BioNet Records (10km)	Geographical Restrictions (Y/N)	Habitat (Present / Condition)	Records from Deployed Equipment (Y /N/ NA)	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Species Credits Apply (Y /N)
Phascolarctos cinereus									
Common Planigale *Planigale maculata*	Y	Y	0	N	Species was not observed during surveys. There are no records of this species within 10km of the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N
Grey-headed Flying-fox *Pteropus poliocephalus*	Y	Y	28	N	A single individual was observed during surveys in August 2022, roosting in daylight in a *Melaleuca ericifolia*. No roost camp is present, and this species was not observed at any other time. Although species may visit the site on the occasional basis, there is no significant roosting or breeding activity on site.	N	Y	Y	N
Red-backed Button-quail *Turnix maculosus*	Y	Y	0	N	Species was not observed during surveys. There are no records of this species within 10km of the Subject Site. There is limited suitable habitat on site, owing to the grassland management conducted by the land managers. It is considered unlikely that this species will be present.	N	N	N	N
Mahony's Toadlet *Uperoleia mahonyi*	Y	Y	0	N	Species was not observed during targeted frog surveys after rain. There are no records of this species within 10km of the Subject Site. It is considered unlikely that this species will be present.	N	N	N	N

1.4.6 Summary Survey Results

Given the works conducted on the development site and adjacent lands as detailed in **Table 8** with results summarised in **Appendices B** and **C**, it is considered that sufficient information exists to determine the presence of species or otherwise, and relative impact levels from development.

Threatened species recorded within the Subject Site and/or nearby surrounds (this survey, previous surveys, Atlas records, anecdotal records) include:

- *Rhodamnia rubescens* (Scrub Turpentine)
- Southern Myotis (*Myotis macropus*)

Rhodamnia rubescens generates credits. *Myotis macropus* does not generate credits due to the presence of habitat constraints (no HBTs). Records and species polygons for *Rhodamnia rubescens* in the Study Area are mapped in **Figure 9**. Records of *R. rubescens* in the 1500m buffer are provided in **Figure 10**.

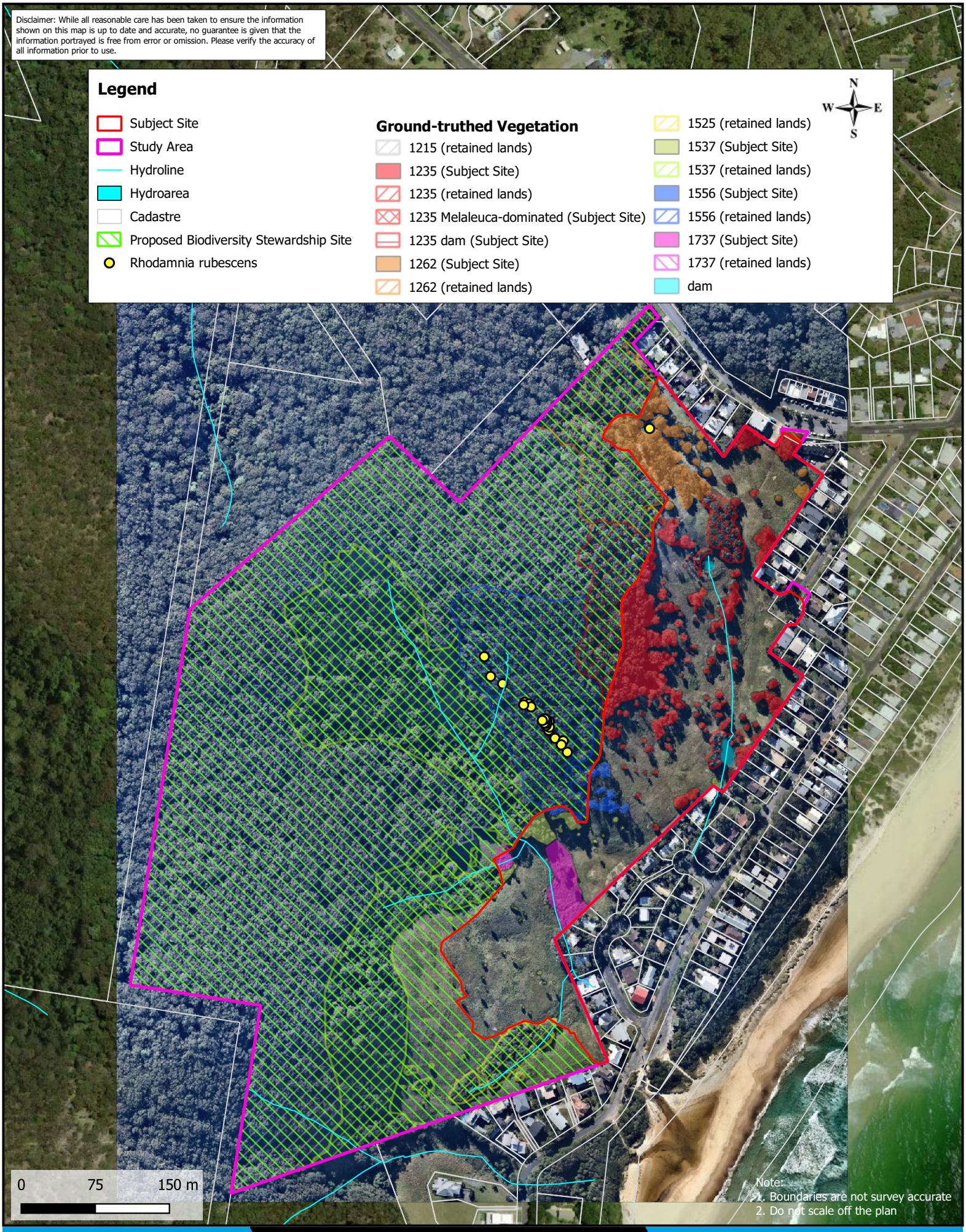


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Figure 9 - Rhodamnia Locations

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 00030048

Client: Addenbrooke Pty Ltd

AEP ref: 2506.03

2.0 Stage 2 – Impact Assessment (Biodiversity Values)

Section 8 of the BAM provides a list of measures that need to be taken into consideration during project planning and design, to minimise impacts upon native vegetation, habitat and other prescribed biodiversity values. Applicable measures taken as part of this project to minimise impacts are provided below.

2.1 Avoid and Minimise Summary

Section 7 of the BAM provides a list of measures that need to be taken into consideration during project planning and design to minimise impacts upon native vegetation, habitat and other prescribed biodiversity values. Applicable measures taken as part of this project to minimise impacts are provided below.

The avoid and minimise strategy for this development (in accordance with Section 7 of the BAM), is discussed in greater detail in **Table 18** below.

The prescribed impact risk assessment and mitigation measures (in accordance with Section 9 of the BAM) are included in **Tables 18** to **25** below.

The following measures in **Section 2.2** have been provided to help mitigate the impacts of construction and the ongoing operation of the proposed development on the biodiversity values identified within the Subject Site and surrounds.

2.2 Project Design Avoidance and Minimisation Measures

The Project Design has undergone several iterations to avoid and minimise impacts upon the biodiversity values of the site. Initial designs (**Appendix A**) encroached into the C2 lands and proposed to remove the entirety of PCT 1525 as well as 4 *Rhodamnia rubescens*. The latest design has scaled back works to avoid all but one *Rhodamnia* as well as all but less than 0.01ha of PCT 1525.

2.2.1 Avoidance Measures

The Subject Site has been placed primarily within R2 land, which coincides with the lowest quality native vegetation and the majority of non-native vegetation in the Study Area. The current project design avoids impacts on the C2 Environmental Conservation land and several specimens *Rhodamnia rubescens* in the centre of the Study Area.

Based on desktop assessment, BAM plots and RDPs, the Study Area has been determined to contain seven (7) PCTs in varying vegetation conditions from Degraded to Good, comprising a total of 27.15ha:

- PCT 1215 – *Spotted Gum – Grey Ironbark open forest of the Macleay Valley lowlands of the NSW North Coast Bioregion*, commensurate with EEC *Subtropical Coastal Floodplain Forest of the NSW North Coast Bioregion*;
- PCT 1235 - *Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion*, commensurate with EEC *Swamp Sclerophyll Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions*;
- PCT 1262 - *Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast*;

- PCT 1525 - *Sandpaper Fig - Whalebone Tree warm temperate rainforest*, commensurate with EEC *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregions*.
- PCT 1537 - *Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast*, commensurate with EEC *Littoral Rainforest in NSW North Coast, Sydney Basin and South East Corner Bioregions;*
- PCT 1556 - *Tallowwood – Smooth-barked Apple – Blackbutt grass tall open forest of the Central and lower North Coast*, commensurate with EEC *River-flat Eucalypt Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions*; and
- 1737 - *Typha rushland*, commensurate with EEC *Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions*.

The remaining vegetation within the Study Area is classed as non-native/ managed, comprising a total of 7.89ha.

The proposed development will impact on six (6) of the PCTs. Vegetation within the Subject Site is of lower condition than vegetation in the remainder of the Study Area and comprises:

- PCT 1235 (approx. 1.58ha);
- PCT 1262 (approx. 0.55ha);
- PCT 1537 (approx. 0.13ha);
- PCT 1556 (approx. 0.1ha); and
- PCT 1737 (approx. 0.26ha).

avoiding approx. 24.88ha of native vegetation within the Study Area.

Presence of large remnant vegetation to the west zoned a C2 that is part of a Protection of Wildlife Corridor demonstrates continued habitat connectivity that is not incompatible with the proposed development footprint at the Subject Site. A Wildlife Corridor Management Plan (WCMP) is included as **Appendix N**.

Continual updates to the project design have avoided impacts to PCT 1525, commensurate with EEC *Lowland Rainforest in NSW North Coast and Sydney Basin Bioregions*. It was determined that only a single area constituting this PCT/EEC was present in the Study Area, and a conscious choice was made to modify the project design to retain the majority of this patch, with less than 0.01ha being impacted.

Similarly, design choices were made to avoid the southern extent of multiple *Rhodamnia rubescens* specimens observed in the centre of the Study Area. These *Rhodamnia* are in relatively good health, with relatively good habitat surrounding them, so the decision was made to avoid these plants. For the treatment of the single *Rhodamnia* located within the Subject Site, see **Section 2.2.2.3**.

2.2.2 Minimisation Measures

The following measures have been incorporated into the design to ensure impacts are minimised during the construction and ongoing operation of the proposed development, recommended VMP, water quality and hydrologic measures, protection measures for retained vegetation, tree management, fencing and other general measures.

2.2.2.1 Proposed Biodiversity Stewardship Site

It is proposed that the retained lands in the Study Area be managed as a Biodiversity Stewardship Site. Investigations were started through Rapid Data Point surveys to gain an initial overview of the area. Further surveys are scheduled to formally determine biodiversity values of the site, and a BSSAR will be developed.

2.2.2.2 Biodiversity Management

The latest iteration of the proposed development plan has sought to protect and regenerate vegetation under a VMP and to identify and mitigate impacts under a Wildlife Corridor Management Plan.

It is a requirement in the Great Lakes Development Control Plan (DCP) 2013, clause 16.14.3 for *Livistona australis* (Cabbage Tree Palms) removed for development to be relocated within the land. 32 *Livistona* are mapped on the Subject Site. These individuals will be utilised in both the regeneration of the VMP lands, as laid out in the Vegetation Management Plan, and in landscaping, as laid out in the Landscape Management Plan.

Vegetation Management Plan

The focus of the VMP land is to protect retained riparian land. The VMP schedules:

- The role of the Project Ecologist in construction works;
- Rehabilitation of retained lands (riparian zones);
- Protection of retained lands from construction impacts;
- Protect native fauna welfare from clearance impacts; and
- Management of native fauna disturbed.

The VMP is provided as **Appendix M**.

Wildlife Corridor Management Plan

This plan determines any impacts to the mapped Wildlife Corridor and proposes management actions to mitigate any potential impacts. The WCMP is provided as **Appendix N**.

2.2.2.3 Water quality and Hydrology

- An Erosion and Sedimentation Control Plan (ESCP) should be prepared for the proposal following guidelines from *Landcom* (2004);
- Prior to construction, best practice erosion and sedimentation controls should be put in place to limit offsite movement of materials into the adjacent vegetation;
- The Project Ecologist would review compliance and provide Council with compliance letter; and
- Erosion and sedimentation controls should be checked daily and maintained in working order especially after rain events for the construction period.

2.2.2.4 Fencing

All temporary and permanent fencing within the Subject Site must allow for movement of fauna. Following the completion of clearing works, rural style ‘post and rail’ fencing should be installed to

protect the retained vegetation during operational phase of the development. Barbed wire should not be used for any fencing

2.2.2.5 General Construction & Operation

Site specific avoid and minimise measures (in accordance with Section 8 of the BAM) are discussed in **Tables 18** and **19** while **Tables 20** to **23** assesses the direct, prescribed, indirect and residual impacts associated with the development and how they are to be mitigated.

The following measures are provided to help mitigate impacts of the construction and ongoing operation of the proposed development on the biodiversity values on adjoining land:

- A Project Ecologist should be appointed to oversee compliance with ecological measures to mitigate construction impacts and report compliance.
- For the clearing phase, retained vegetation will be delineated by safety bunting flags, fencing and signage indicating environmental protection zone, which will still allow fauna to egress the development area as needed. Following the completion of clearing works, rural style 'post and rail' fencing should be installed to protect the retained vegetation during operational phase of the development. Barbed wire should not be used for any fencing;
- Suitable native species to be incorporated in the landscape design to provide future resources for native fauna;
- Vegetation clearing is to be timed to avoid cold weather periods where overnight temperatures are forecast to be less than 12°C. Cold weather is likely to make it difficult for resident hollow dependent fauna to successfully relocate. This is particularly relevant for low body-weight species;
- A staged approach to clearing is to be undertaken to provide fauna the opportunity to disperse outside the area of impact. Staging to include Phase 1 Clearing: Underscrubbing, Phase 2 Clearing: Removal of non-habitat trees, and Phase 3 Clearing: Removal of habitat and connecting trees;
- All clearing works to be undertaken under the supervision of the Project Ecologist;
- Clearing should occur in a direction from previously disturbed lands towards retained lands;
- Implement clearing protocols, including pre-clearance surveys to identify habitat and vegetation to be retained;
- All clearing works to be attended by a suitable equipped and experienced ecologist to deal appropriately with any displaced fauna species;
- All hollow bearing features will be sectionally lowered by tree climbers (where safe to do so);
- Any fauna rescued during vegetation clearing is to be assessed for injuries, and subsequently released to a suitable nearby location; this may require holding fauna until dusk for release in accordance with relevant animal ethics licencing and standards;
- If any fauna is injured during vegetation clearing, they are to be taken promptly to a nearby veterinarian or suitable wildlife carer contact;
- In addition, prior to clearing of any vegetation, an ecologist is to inspect the area for any signs of resident fauna requiring attention, and in particular nesting birds. Where such is identified,

appropriate strategies are to be developed and instigated to minimise impacts. Pre-clearance surveys to include diurnal surveys, stag-watching and nocturnal surveys;

- Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection;
- Any suitable hollows recovered during clearing works should be reconditioned into suitable hollows and installed in retained lands in addition to the manufactured nest boxes;
- All cleared vegetation is to be mulched on site and spread to help stabilise any exposed soil and minimise offsite movement of biomass. Fallen timber and hollow logs identified to be retained to be relocated into the retained lands;
- Live mulch and topsoil of local provenance is an ideal way to begin rehabilitation of conservation lands;
- Implement hygiene protocols for machinery to prevent the spread of weeds outside the development site;
- Protocols within the Construction Environmental Management Plan (CEMP) to manage Acid Sulphate Soils; and
- Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise downstream hydrology changes.

Additional measures are set out in the VMP and WCMP.

2.2.2.6 Management of Vegetation for Bush Fire Protection

Defendable space within the west of the development footprint will be retained within the adjacent retained lot and managed as Asset Protection Zone (APZ) in accordance with PBP 2019.

Table 18 – Impact avoidance and minimisation

Objectives/Requirements	Evidence of compliance
Locate the proposal to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat.	
Knowledge of biodiversity values should inform decisions about the location of the proposal. The initial assessment of biodiversity values from Stage 1 may be used to inform the early planning of the route or location of a proposal.	The Study Area Comprises 35.08ha of which a total of 27.15ha is native vegetation. The Subject Site comprised of a small area within the Study Area totalling approx. 8.88ha of which only 2.27ha is native vegetation. An extensive amount of field survey has been carried out to identify populations of threatened flora and fauna species predicted to occur within the Study Area. The species identified within the Subject Site will not be avoided and appropriate credits will be allocated for the impact. It should be noted that the proposal is retaining, regenerating and managing under a VMP a portion (approx. 0.16ha) of native vegetation within the Subject Site. It is considered unlikely that the development will have significant impacts on the species identified within the Subject Site, given the retention of habitat within the Study Area.
Selecting a final proposal location may be an iterative process. Decisions may need to be revisited after all field surveys have been completed.	As the proposal is permissible within the zoning regulations for the site, and vegetation on site is generally in poor to degraded condition, it has been determined that current location for the proposal has minimised the impacts across the Study Area.
Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas: *lacking biodiversity values*	As reflected in the Biodiversity Values Map, a proportion of the Study Area contains biodiversity values (Littoral Rainforest), although none are mapped on the Subject Site. The current design has acknowledged the areas of Biodiversity Value recommendations have been made to minimise development in these areas. See **Appendix I** for Littoral Rainforest Assessment under Resilience and Hazards SEPP.
where the native vegetation or threatened species, habitat is in the poorest condition (i.e., areas that have a low vegetation integrity score)	The native vegetation within the Subject Site is classified as degraded to moderate comprising approximately 2.27ha of native vegetation, and around 5.38ha of non-native vegetation. The Study Area Comprises 35.08ha of which a total of 27.15ha is native vegetation. It should be noted that the proposal is retaining and managing under a VMP a section of native vegetation within the Study Area.
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 or a highly cleared PCT.	There are no biodiversity values mapped land on the Subject Site. Five (5) of the six (6) PCTs have been determined as TECs, but are in poor or degraded condition, as compared to vegetation outside the Subject Site that is of higher biodiversity value.
outside of the buffer area around breeding habitat features such as nest trees or caves.	There are no Important Areas mapped for the Regent Honeyeater, Swift Parrot or migratory shorebirds identified within the site.
When selecting a proposal's location, all of the following should be analysed. Justification for the decisions in determining the final location must be based on consideration of:	Consideration of alternative modes or technologies have been reviewed and used within the footprint layout of a development within the subject site. Examples of such modes or technologies include implementation of WSUD principals in design, to ensure that the water quality and quantity standards are meet and will reduce impact on surrounding lands.

Objectives/Requirements	Evidence of compliance
alternative modes or technologies that would avoid or minimise impacts on biodiversity values	
alternative routes that would avoid or minimise impacts on biodiversity values	The site is zoned under the LEP for residential development, meaning the development has suitability for the area. The direct impacts upon the vegetation that are associated with the proposal are considered unavoidable to allow for the site to be developed.
alternative locations that would avoid or minimise impacts on biodiversity values	There are no biodiversity values mapped in the Subject Site. The Subject Site is downslope from biodiversity values mapped land and is unlikely to cause significant impacts to that land.
alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.	The development footprint has been placed within the most degraded section of the Study Area. There are no biodiversity values mapped in the Subject Site. The Subject Site is downslope from biodiversity values mapped land and is unlikely to cause significant impacts to that land.
The proposal may also list and map site constraints, such as: *bushfire protection requirements, including clearing for asset protection zones* *flood planning levels* *servicing constraints*	The Subject Site boundary has been set out to incorporate bushfire protection areas, flood mitigation measures and utilities locations.
In the BDAR or BCAR, the assessor must document and justify any actions taken to avoid or minimise impacts through careful location of the proposal.	Field surveys have been carried out to identify threatened species within the area. A sufficient amount of field survey has been carried out over the years throughout the site since 2021 – 2022. These surveys have identified a number of threatened species that are likely to be impacted by the development. The proposal has been designed to follow the principles of avoid and minimise by utilising cleared land that has previously been grazed and is currently being slashed.
Design the proposal to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat	
The BDAR or BCAR must document the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities. The types of measures that can be used to demonstrate this include: *reducing the proposal's clearing footprint by minimising the number and type of facilities*	The site has been zoned for the proposed development. The removal of vegetation will occur across a small portion of the Study Area, with the retention and management of 0.16ha of native vegetation within the Subject Site under a VMP. As explained above, the impacts on 2.27ha is considered unlikely to have a significant impact on the species located within the Subject Site. A large portion of the Subject Site (6.26ha) is classed as non-native vegetation / managed land. and has been proposed to form part of the development, reducing the impact on native vegetation within the broader Study Area. The remainder of the Study Area is proposed to be managed as a Biodiversity Stewardship Site. A Biodiversity Stewardship Site Assessment Report (BSSAR) is currently being developed. The location of the upgrades will have minimal impact on connectivity to the west as the connecting vegetation with these existing vegetated areas will be retained.

Objectives/Requirements	Evidence of compliance
	The proposal has recommended weed management and regeneration works within the retained land, contributing to the broader conservation in the general surrounds.
locating ancillary facilities in areas that have no biodiversity values	The whole development footprint will be located within the Subject Site. There are no mapped biodiversity values within the Subject Site.
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)	PCTs within the Subject Site are in degraded to moderate condition. Vegetation is in lower quality within the Subject Site than elsewhere in the Study Area.
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)	All works will be located within the Subject Site as mapped in **Figure 1**. Avoidance of impacts on threatened entities has been conducted where possible.
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.	A Vegetation Management Plan has been created for the site and is included as **Appendix M**.
The BDAR or BCAR must document and justify efforts to avoid or minimise impacts through design.	Field surveys have been carried out to identify threatened species within the area. A sufficient amount of field survey has been carried out over the years throughout the site since 2021 – 2022. These surveys have identified a number of threatened species that are likely to be impacted by the development. The proposal has been designed to follow the principles of avoid and minimise by utilising cleared land that has previously been grazed and is currently being slashed.

Table 19 – Prescribed impact avoidance and minimisation

Objectives/Requirements	Evidence of compliance
Avoid or minimise prescribed impacts when planning the proposal	
The timing and extent of a prescribed impact on the habitat of threatened entities can be difficult to assess and adequately offset through the provision of biodiversity credits. Prescribed impacts may occur on habitat features that are not native vegetation, e.g., caves, rocky outcrops and flyways. Because these types of features cannot be readily replaced or offset, it is important that measures to avoid or minimise impacts are undertaken and are clearly documented in the BDAR or BCAR.	The Subject Site has no caves, rocky outcrops, or flyways, and the exotic grassland provides little to no habitat for native flora and fauna. As such it has been determined suitable for these areas to be developed.
Locate the proposal to avoid or minimise prescribed biodiversity impacts	
To avoid or minimise prescribed biodiversity impacts, the proponent must consider how to: locate surface works to avoid direct impacts on the habitat features identified in Chapter 6	a) - e) The Subject Site: Does not contain karsts, caves, crevices, cliffs, rocks and other features of geological significance supporting threatened species and ecological communities; Does not contain rocks supporting habitat for threatened species and ecological communities; Does not contain human made structures containing habitat for threatened species and ecological communities; Vegetation present within the Subject Site is well connected to large tracts of native vegetation (>1000ha patch size) directly adjacent to the west. It is envisaged that detailed design of the development will incorporate WSUD principals to reduce the development impacts on water quality, water bodies and the hydrological process. Wind turbines are not proposed. Given that the development will likely have speed restricted to a maximum of 50km/hr, the likelihood of vehicle strike is considered much lower than higher speed roads. Waterbodies on site will be retained and improved under the Vegetation Management Plan.
locate subsurface works, in both the horizontal and vertical planes, to avoid and minimise operations beneath the habitat features identified in Chapter 6. For example, locating longwall panels away from geological features of significance, groundwater-dependent plant communities and their supporting aquifers	a) - e) The Subject Site: Does not contain karsts, caves, crevices, cliffs, rocks and other features of geological significance supporting threatened species and ecological communities;

Objectives/Requirements	Evidence of compliance
	Does not contain rocks supporting habitat for threatened species and ecological communities; Does not contain human made structures containing habitat for threatened species and ecological communities; Vegetation present within the Subject Site is well connected to large tracts of native vegetation (>1000ha patch size) directly adjacent to the west. It is envisaged that detailed design of the development will incorporate WSUD principals to reduce the development impacts on water quality, water bodies and the hydrological process. Wind turbines are not proposed. Given that the development will likely have speed restricted to a maximum of 50km/hr, the likelihood of vehicle strike is considered much lower than higher speed roads. Waterbodies on site will be retained and improved under the Vegetation Management Plan.
locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths, to important habitat or local movement pathways	a) - e) The Subject Site: Does not contain karsts, caves, crevices, cliffs, rocks and other features of geological significance supporting threatened species and ecological communities; Does not contain rocks supporting habitat for threatened species and ecological communities; Does not contain human made structures containing habitat for threatened species and ecological communities; Vegetation present within the Subject Site is well connected to large tracts of native vegetation (>1000ha patch size) directly adjacent to the west. It is envisaged that detailed design of the development will incorporate WSUD principals to reduce the development impacts on water quality, water bodies and the hydrological process. Wind turbines are not proposed. Given that the development will likely have speed restricted to a maximum of 50km/hr, the likelihood of vehicle strike is considered much lower than higher speed roads.

Objectives/Requirements	Evidence of compliance
	Waterbodies on site will be retained and improved under the Vegetation Management Plan.
d) optimise the proposal layout to minimise interactions with threatened entities; for example, design a wind farm that has: 100 m turbine-free buffers around features that attract and support aerial species, such as forest edges, riparian corridors, wetlands, ridgetops and gullies turbine-free corridors in zones of regular movement for species of concern, to avoid a barrier effect	N/A
locate the proposal to avoid impacts on water bodies or hydrological processes	Waterbodies on site will be retained and improved under the Vegetation Management Plan.
When locating a proposal, the following need to be analysed and justification should be provided for each alternative selected: alternative modes or technologies that would avoid or minimise prescribed impacts	Consideration of alternative modes or technologies have been reviewed and used within the footprint layout of a development within the subject site. Examples of such modes or technologies include implementation of WSUD principals in design, to ensure that the water quality and quantity standards are meet and will reduce impact on surrounding lands.
alternative routes that would avoid or minimise prescribed impacts	Access is constrained by the existing infrastructure. It is therefore not feasible for the development to proceed with alternatives routes for roads and linear services without impacting broad areas of remnant native vegetation.
alternative locations that would avoid or minimise prescribed impacts	The Subject Site is sited to cause the least amount of impact, through consideration of land zoning, vegetation presence and quality, and habitat assessment. The chosen site contains little to no native vegetation. Vegetation present is lower quality than that in the retained lands and has little habitat value.
alternative sites within a property on which the proposal is located that would avoid or minimise prescribed impacts.	The site was selected based on the current zoning, use and condition of the site.
Justifications for a proposal's location should identify any other site constraints that the proponent has considered in determining the location and design of the proposal, such as: bushfire protection requirements, including clearing for asset protection zones flood planning levels servicing constraints.	The Subject Site boundary has been set out to incorporate bushfire protection areas, flood mitigation measures and utilities locations.
The assessor must document and justify in the BDAR or BCAR all efforts to avoid, or the reasonable measures proposed to minimise, prescribed impacts when choosing the proposal's location.	Field surveys have been carried out to identify threatened species within the area. A sufficient amount of field survey has been carried out over 2021 and 2022. These surveys have identified some threatened species that are likely to be impacted by the development. The Subject Site is sited to cause the least amount of impact, through consideration of land zoning, vegetation presence and quality, and habitat

Objectives/Requirements	Evidence of compliance
	assessment. The chosen site contains little to no native vegetation. Vegetation present is of low quality and has little habitat value. The remainder of the Study Area is proposed to be managed as a Biodiversity Stewardship Site. A Biodiversity Stewardship Site Assessment Report (BSSAR) is currently being developed.
Design the proposal to avoid or minimise prescribed impacts	
Design measures that can avoid or minimise prescribed impacts include: a. engineering solutions, such as proven techniques to: i. minimise fracturing of bedrock underlying features of geological significance, or groundwater-dependent communities and their supporting aquifers ii. restore connectivity and movement corridors	a) – e) As explained above, the site is appropriate for development as a result of the land zoning, the existing use and vegetation condition. The proposal is looking to minimise impacts within the MidCoast LGA by utilising all the existing infrastructure and retaining connectivity with adjoining lands As stated above the proposed development limits clearing to 2.27ha of native vegetation whilst retaining and managing under a VMP 0.41ha of native vegetation within the Subject Site and 22.99ha in the Study Area. The design also avoids the areas that are connected to surrounding vegetation allowing for connectivity to be maintained. The site was selected based on the current zoning and current use of the site. Consideration of alternative modes or technologies, routes, alternative locations and sites is considered unnecessary as the development of the site is considered to be consistent with MidCoast Council standards.
b. design elements that minimise interactions with threatened entities, such as: i. designing turbines to dissuade perching and minimise the diameter of the rotor swept area ii. designing fencing to prevent animal entry to transport corridors iii. providing vegetated buffers rehabilitated with native species	Wind turbines are not proposed. The Landscape Management Plan contains details of boundary creation between the development and retained lands. Terraced retaining walls are proposed with native plantings to create a vegetative and aesthetic buffer between the subdivision and the retained native vegetation.
c. maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation	Non-native vegetation features on site include small piles of rubble and three (3) dams. The rubble will be removed as part of the development, but suitable equivalent habitat will be made present through the construction of retaining walls at the boundary of the development site and retained lands. Two (2) of the dams will be re-engineered and planted as detention basins (see Landscape Management Plan).
d. maintaining hydrological processes that sustain threatened entities	A portion of one of the existing drainage lines on site will be maintained and rehabilitated under the VMP.
e. controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities.	The proposed development includes several engineered structures to manage stormwater that runs through and off the site currently. At present, stormwater runoff is causing localised flooding in properties to the south east of the Subject Site. The development proposes several vegetation detention basins to manage these runoff patterns.

Objectives/Requirements	Evidence of compliance
The proposed measures must be evidence-based and directed towards the threatened entities identified in Chapter 6. The BDAR or BCAR must document the designs that are proposed to avoid or minimise prescribed impacts.	Field surveys have been carried out to identify threatened species within the area. A sufficient amount of field survey has been carried out over 2021 and 2022. These surveys have identified some threatened species that are likely to be impacted by the development. The Subject Site is sited to cause the least amount of impact, through consideration of land zoning, vegetation presence and quality, and habitat assessment. The chosen site contains little to no native vegetation. Vegetation present is of low quality and has little habitat value.

2.3 Assessment of Impacts

Section 9.1.1.2 of the BAM states that the BDAR "*must assess the impacts of the project on native vegetation and habitat*". In addition to this, Sections 9.1.4 and 9.2 require that further assessment be produced for any impact, including biodiversity impacts, expected in land surrounding the Subject Site. Impacts that are not subject to avoid and minimise measures are assessed as follows.

Table 22 below assesses the direct impacts from the proposed development and **Table 23** assesses any potential prescribed impact from the proposed development.

Table 24 describes the indirect impact assessment and **Table 25** assesses any residual impacts from the proposed development.

Table 20 – Risk Matrix

Maximum reasonable consequence	Probability A	B	C	D	E
1	CR	CR	HR	HR	MR
2	CR	HR	HR	MR	LR
3	HR	HR	MR	LR	LR
4	HR	MR	LR	LR	LR
5	MR	LR	LR	LR	LR

CRITICAL	CR
HIGH RISK	HR
MEDIUM RISK	MR
LOW RISK	LR

Table 21 – Potential Prescribed Impacts from the Proposed Development

Consequence criteria: Impacts on threatened species and/or threatened species habitat
1. CRITICAL Impact – Severe; Spatial scale – Widespread; Time scale – Long-term. Requires consideration of whether impacts may result in a Serious and Irreversible Impact that may lead to local extinction.
2. MAJOR Impact – Moderate; Spatial scale – Moderate to widespread; Time scale – Mid- to long-term. May result in temporary or long-term damage.
3. MODERATE Impact – Moderate; Spatial scale – Local to moderate; Time scale – Short- to mid-term. May result in a moderate, temporary impact. However, it may be difficult to rehabilitate impact and may have negative implications on the ecosystem
4. MINOR Impact – Minor; Spatial scale – Local; Time scale – Short-term. May result in minor impacts that are relatively easily rehabilitated. Not likely to have negative implications on the ecosystem.
5. NEGLIGIBLE Impact – Minor; Time scale – Short-term with no lasting effect.

Likelihood criteria
A. Almost certain Very high or certain probability that impact will occur, or event is of a continuous nature.
B. Likely Likely probability that impact will occur, or event is frequent (frequency 1-5 years).
C. Moderate Moderate probability that impact will occur, or event is infrequent (frequency 5-20 years).
D. Unlikely Low probability that impact will occur, or event is very infrequent (frequency 100 years).
E. Remote Very low probability that impact will occur or may occur under extenuating circumstances. Event is very rare or stochastic in nature (frequency 1000 years)

Table 22– Direct Impact Assessment

Aspect	Project Phase	Potential Impact	Potential Frequency	Mitigation	Responsibility	Risk before mitigation	Risk after mitigation
Native vegetation	Pre-construction	Removal of 2.27ha of native vegetation including potential habitat for 39 ecosystem credit species	Once	Development within most disturbed part of the Study Area, with a small amount of highly degraded residual native vegetation.	Design Project Ecologist	HR	MR
Threatened native vegetation	Construction	One (1) *Rhodamnia rubescens* will be impacted by the proposed development.	Once	Because this individual is heavily infected with *A. psidii,* it is not considered viable in the long term.		LR	LR
Fauna home range and connectivity	Pre-Construction and Construction	Disturbance to fauna habitat during clearing and construction operations	Continuous	Installation of a fauna-protecting fence, including relevant signage, to create a fauna protection zone. A permanent fence should be installed once construction of the new development is complete.	Project Manager Construction staff Site Manager Project Ecologist	HR	LR
	Operation	Reduction in connectivity	Continuous	The development will not cause a reduction in connectivity, as it is situated in areas that already have little to no connectivity.	Council Project Manager Project Ecologist	MR	LR
Reduction of biodiversity values	Pre-Construction, Construction and Operation	Damage to retained trees	Continuous	Installation of a fence as per the item above, including relevant signage, to create a tree protection zone. Communication of fence location and mapping to all staff involved in clearing and construction operations. Regular inspection of fence by Project Ecologist to monitor and fix if and where necessary.	Project Manager Construction staff Site Manager Project Ecologist	HR	LR
	Construction	Sediment run-off into retained vegetation area	Continuous	Best practice erosion and sedimentation (ERSED) control methods to be adopted, enforced and maintained throughout vegetation works, so as to avoid any movement of sediments resulting from clearing and construction into the retained vegetation lands.	Project Manager Construction staff Site Manager	MR	LR

Aspect	Project Phase	Potential Impact	Potential Frequency	Mitigation	Responsibility	Risk before mitigation	Risk after mitigation
					Project Ecologist		
		Changes to stormwater evacuation	Continuous	Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise hydrology changes.	Project Manager Construction staff Site Manager Project Ecologist	MR	LR

Table 23 – Prescribed Impact Assessment

Subject of Prescribed Impact	Project Phase	Frequency	Mitigation	Responsibility	Risk before mitigation	Risk after mitigation
Habitat of threatened species or ecological communities associated with: (i) Karst, caves, crevices, cliffs and other geological features of significance or (ii) rocks, or (iii) human made structures, or (iv) non-native vegetation	No such habitat on site. Not applicable					
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Construction and operation	Continuous	The development has been situated in an area that already has little to no connectivity. Pockets of vegetation will be retained and managed under a VMP, with additional requirements for fauna-friendly plantings in landscaping also set out in the VMP.	Project Manager Project Ecologist	MR	LR
Movement of threatened species that maintains their lifecycle	Construction and operation	Continuous	The development has been situated in an area that already has little to no connectivity. Pockets of vegetation will be retained and managed under a VMP, with additional requirements for fauna-friendly plantings in landscaping also set out in the VMP.	Project Manager Project Ecologist	MR	LR
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	Construction and operation	Once	Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise hydrology changes. Best practice erosion and sedimentation (ERSED) control methods to be adopted, enforced and maintained throughout vegetation works, so as to avoid any movement of sediments resulting from clearing and construction into the retained vegetation lands.	Project Manager Project Ecologist	MR	LR
Wind turbine strikes on protected animals	No wind turbines will be installed on site. Not applicable.					
Vehicle strikes on threatened species or on animals that are part of a TEC	Construction and operation		Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection. During operation, such impacts will be mitigated through the introduction of low-speed limits as well as speed limiting devices on the precincts' roads.	Project Manager Construction staff Site Manager Project Ecologist	HR	MR

Table 24 – Indirect Impact Assessment

Aspect	Project Phase	Potential Impact	Frequency	Mitigation	Responsibility	Risk before mitigation	Risk after mitigation
Noise	Construction	Noise during construction due to construction works and construction traffic. Potential disturbance to threatened species or reduced viability of adjacent retained habitat zone	Continuous during construction hours	Timing of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP) which will include a Noise Mitigation Plan.	Project Manager Construction staff Site Manager	HR	MR
	Operation	Noise due to traffic. Potential disturbance to threatened species or reduced viability of adjacent retained habitat	Continuous	The proposal will not significantly increase the noise currently present at the Subject Site, given its nature as a retirement village. Construction of fencing at the boundaries of the site will dampen sound.	Civil Contractor	MR	LR
Vibration	Construction	Disturbance to fauna which may lead to displacement to adjacent areas	Continuous	Conditions of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP).	Project Manager Site Manager Construction staff	HR	MR
Dust	Construction	Dust deposits on native flora and fauna habitat, resulting in disturbance to and reduced viability of adjacent habitat	Continuous	Dust levels during operations managed according to an approved CEMP: • Daily monitoring of dust generated by construction activities. • Dust suppression measures (setting maximum speed limits and application of dust suppressants) will be	Project Manager Site Manager Construction staff	LR	LR

Aspect	Project Phase	Potential Impact	Frequency	Mitigation	Responsibility	Risk before mitigation	Risk after mitigation
				implemented during construction works to limit dust on site			
Light spill	Construction	Disturbance to nocturnal fauna, thus reducing viability of adjacent retained habitat zone	Continuous	Optimal construction methods as per an approved CEMP will reduce instances of light spill. Such measures will include limiting use of lights where necessary and directing lights in such a way as to limit impact on adjacent retained vegetation lands.	Project Manager Site Manager Construction staff	LR	LR
	Operation	Disturbance to nocturnal fauna, thus reducing viability of adjacent retained habitat zone	Continuous	Provision of lighting will be in accordance with an approved CEMP. Permanent lighting shall be designed to minimise light spill to retained vegetation.	Civil Contractor	MR	LR
Non-native vegetation	Construction	Soil disturbance may lead to proliferation of exotic flora (including invasive weeds) through seeds and vegetation fragments	Continuous	As per an approved CEMP including a VMP: • Appropriate handling of mulch created from the removal of exotic vegetation • Appropriate cleaning of all construction equipment to limit the risk of weed seed and fragments to adjacent retained areas • Chemical and manual treatment of weeds where applicable	Project Manager Site Manager Construction staff	MR	LR

Aspect	Project Phase	Potential Impact	Frequency	Mitigation	Responsibility	Risk before mitigation	Risk after mitigation
	Operation	Constant human traffic and changes to hydrology may result in frequent reintroduction of exotic species. Landscaping may encourage use of exotic species.	Continuous	The implementation of a VMP will protect the quality of vegetation in retained lands. Fencing will reduce likelihood of exotic species entering retained lands.	Project Manager Site Manager	MR	LR
Visual amenity	Construction	Rubbish and waste retained onsite attracting native and pest fauna	Continuous	Activities on the Site will be managed in accordance with an approved CEMP and designed to limit the amount of rubbish and waste onsite through good housekeeping practices.	Project Manager Site Manager Construction staff	LR	LR
	Operation	Rubbish and waste retained onsite attracting native and pest fauna	Continuous	Suitable fencing to be installed and maintained between development and retained lands to prevent access and degradation of retained lands	Civil Contractor	LR	LR

Table 25 – Residual Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation / Minimisation	Residual Impact Description	Impact to be offset (see Section 2.3.2)
Reduction of biodiversity values	Construction Operation	Clearing of 3.72ha of native vegetation	The development has been situated in an area that already has little to no connectivity. Pockets of vegetation will be retained and managed under a VMP, with additional requirements for fauna-friendly plantings in landscaping also set out in the VMP. The remainder of the Study Area is proposed to be managed as a Biodiversity Stewardship Site. A Biodiversity Stewardship Site Assessment Report (BSSAR) is currently being developed.	The VMP and CEMP will protect the retained 0.14ha and adjoining lands during construction and operation. Offsets delivered.	Yes
Noise, dust, light spill	Construction	Disturbance to local fauna	Application of CEMP / VMP as mentioned above	Noise, dust and light spill will still occur but a low magnitude, thus keeping the impact on local fauna to a low level	No

2.4 Impact Summary

Credit requirements were quantified via the input of the site data and impacts detailed above within the BAM Calculator. Both desktop (GIS) and fieldwork data were entered into the Calculator to determine the number of credits required to offset the impacts of the development.

2.4.1 Serious and Irreversible Impacts (SAIIs)

Candidate SAIIs are determined by decision makers (i.e., Council) for each particular threatened species / community based upon four (4) principles listed within the *Guidance and criteria to assist a decision maker to determine a serious and irreversible impact* (DPIE 2019), provided in Table 16. A list of threatened entities (previously Appendix 3 of the *Guidance*) is also provided by DPE (2022). The TECs associated with PCTs 1525, 1556, 1537, 1737 and 1235 are omitted from this list. Considering that "any threatened ecological community not listed in Appendix 3 is unlikely to meet the relevant SAII principles" (OEH 2017), it is considered that the removal of vegetation found on the site is not a serious and irreversible impact.

A single *Rhodamnia rubescens* was observed in the development footprint. An SAII assessment for this species is below at **Section 2.5.1.1**.

Little Bent-winged Bat is listed as a dual credit species, occurring as an ecosystem credit species when foraging habitat is present, and a species credit species and potential candidate Serious and Irreversible Impacts (SAII) species when breeding habitat is present. Breeding habitat is restricted to large mapped colonies, and requires suitable caves, neither of which occur within or near the site. As such, species credits do not apply and SAII considerations are not relevant to the proposal.

2.4.1.1 *Rhodamnia rubescens* SAII Assessment

Table 26 below presents the assessment that is required as per Section 9.1.2 of BAM 2020 for entities for which an impact could be considered a Serious and Irreversible Impact. **Table 27** addresses Appendix B of *Guidance to assist a decision-maker to determine a serious and irreversible impact* for impacts to *Rhodamnia rubescens*. **Figure 10** shows records of the species within 1500m of the Subject Site.

Table 26 – *Rhodamnia rubescens* SAII Assessment

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment – *Rhodamnia rubescens*
2a	Evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the: i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites	I) The species has recently been listed as Critically Endangered as it is projected/or has experienced a population reduction of >80% over three generations or 10 years as a result of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites (NSW Threatened Species Scientific Committee). *R. rubescens* was not regarded as being threatened before 2010 when Myrtle Rust was first discovered on living plants (Sommerville et al. 2020). *Austropuccinia psidii* (Myrtle Rust) infection is the primary cause relating to the reduction in the population. II) Number of distinct populations is unknown but is proposed to be quite large

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment – *Rhodamnia rubescens*
		considering the general distribution of the species. III) No formal estimates of the total abundance of *R. rubescens* across the range is available. IV) Considering the geographic range and that the species was considered common prior to the onset of Myrtle Rust infections in the population, it is anticipated that there would still be a number of large individuals not less than 10,000. V) It is evident however, that seedling recruitment is low from Myrtle Rust infection and the continual impact to the species will further decrease recruitment of young saplings/seedlings into mature trees. **VI)** Myrtle Rust was first detected in Australia on the NSW Central Coast in April 2010.
2b	Evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by: i. an estimate of the species' current population size in NSW, and ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations	I) In 2018, the extent of occurrence was estimated to be 147,340 $km^{2,}$ with the area of occupancy estimated to be 3,360 km^2. II) As there are no record of specific population size within the MidCoast LGA it is assumed that the population is in decline given the development within the region over the past 10 years and impacts from Myrtle Rust resulting in a low recruitment of seedlings and the development of juvenile trees into mature trees. III) Studies have found that all age classes of the species have been affected by Myrtle Rust with disease incidence being greater on immature leaves.
2c	Evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by: i. extent of occurrence ii. area of occupancy iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and iv. whether the species' population is likely to undergo extreme fluctuations	I) In 2018, the extent of occurrence was estimated to be 147,340 $km^{2,}$ II) In 2018, the area of occupancy estimated to be 3,360 km^2 *III) R. rubescens* is known to occur from coastal districts of NSW north from Batemans Bay to Bundaberg Queensland. A total of 2740 records associated with R. *rubescens*. Population is said to be contiguous along the entire range with no significant disjunctions. Population appears to be affected across all geographic ranges by Myrtle Rust. IV) Study by Carnegie et al. (2016) found that trees that were treated with a fungicide recovered from Myrtle Rust, however, trees without the fungicide showed that the disease fluctuated as crown transparency increased in untreated trees. The incidence and severity of Myrtle Rust followed a trend of increase during periods of high rainfall and typically reduced during drier periods over the winter. Environmental / Seasonal changes likely to cause fluctuations to the onset and continuation of the disease. It is evident that the continual impact from Myrtle Rust over time reduces the overall

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment – *Rhodamnia rubescens*
		growth of canopy and subsequent reduction in leaf size and overall production leading to death in the trees.
2d	Evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because: i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g., species is clonal) on, a biodiversity stewardship site ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g., karst systems) on a biodiversity stewardship site, or iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus).	I) Study by Carnegie et al. (2016) found that repeated, severe infection from Myrtle Rust compromised crown health and eventually lead to the death of a tree and can kill mature trees. During the study some trees were treated with a fungicide triadimenol which was effective in controlling Myrtle Rust on *R. rubescens* in the native environment. Therefore, it is likely to respond to continual management if required to preserve the species. II) Continual infection of myrtle rust slowly decreases canopy cover and the ability to photosynthesise. In addition to this the Myrtle Rust prevents the species recruiting seedlings. III) As stated above if properly managed within the stewardship site the species may recover and thrive.
3	Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR or BCAR.	Data deficient.
4a	The impact on the species' population (Principles 1 and 2) presented by: i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the subject land (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and ii. an estimate of the number of individuals (mature and immature) to be impacted by the proposal and as a percentage of the total NSW population, or iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the proposal	There is one (1) individual proposed to be impacted from the development. As previously stated, estimation of the population in NSW region cannot be determined. As such, the site represents marginal habitat and the proposal would not result in any significant changes to available habitat in the context of the immediate surrounds and wider locality.
4b	Impact on geographic range (Principles 1 and 3) presented by: i. the area of the species' geographic range to be impacted by the proposal in hectares, and a percentage of the total AOO, or EOO within NSW ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area	Considering the geographic range and that the species was considered common prior to the onset of Myrtle Rust infections in the population, it is anticipated that there would still be a number of large individuals not less than 10,000. It is evident however, that seedling recruitment is low from Myrtle Rust infection and the continual impact to the species will further decrease recruitment of young saplings/seedlings into mature trees. There is one (1) individual proposed to be impacted from the development.

BAM s9.1.2 Sub Clause	BAM s9.1.2 Provision	Assessment – *Rhodamnia rubescens*
	required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR.	
5	The assessor may also provide new information that can be used to demonstrate that the principle identifying the species as at risk of an SAII, is inaccurate.	A thorough search of relevant department websites and research institutes did not result in new information of identifying SAII risk for the species, or show that land identified at the Subject Site would put the species at risk of an SAII.

Table 27 below addresses Appendix B of Guidance to assist a decision-maker to determine a serious and irreversible impact for impacts to *Rhodamnia rubescens*.

Table 27 – *Rhodamnia rubescens* Appendix B Assessment

BAM 2017 s10.2.3 Provisions	Comment
(a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII	The distribution of native vegetation areas/patches is spread throughout the site. Therefore, given the proposed development footprint, it is highly unlikely that direct impacts to native vegetation / important habitat can be avoided. The proponent has opted to secure part of the site under a VMP. Bushfire Asset Protection Zones, flood mitigation measures, services and water management structures, have been incorporated within the R2 Zoned land, ensuring there will be no C2 directly impacted by the proposed development.
(b) the size of the local population directly and indirectly impacted by the development, clearing or biodiversity certification	The size of the local population is unknown. One (1) individual *R. rubescens* proposed to be removed as a result of this development. Four (4) additional individuals were observed in the Study Area to the west of the Subject Site. *A. psidii* is present in all specimens. There are 20 BioNet Atlas records within 10km of the Subject Site that do not include those observed by AEP during surveys.
(c) the extent to which the impact exceeds any threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact	The SAII Threshold for this species is impacts will cause further decline of a species or ecological community that is currently observed, estimated inferred or reasonably suspected to be in a rapid state of decline. It is envisaged that an SAII can be avoided if via a detailed habitat assessment and the principals of avoid and minimise are applied to a development as detailed in Provision (a) of this table, these being: - Retain high constraint native vegetation within the Subject Site via the implementation of the VMP; - Locate development envelope to avoid areas of high constraint vegetation; and - Apply a Biodiversity Management Plan (VMP) to the Subject Site as part of a DA, to maintain and enhance the condition of retained vegetation / habitat.
(d) the likely impact (including direct and indirect impacts) that the development, clearing or biodiversity certification will have on the habitat of the local population, including but not limited to: (i) an estimate of the change in habitat available to the local population as a result of the proposed development (ii) the proposed loss, modification, destruction or isolation of the available habitat used by the local population, and (iii) modification of habitat required for the maintenance of processes important to the species' life cycle (such as in the case of a plant – pollination, seed set, seed dispersal, germination), genetic diversity and long-term evolutionary development. BioNet Atlas records or other documented, quantifiable means must be used by the	Significant areas of conserved interconnected habitat are available in the immediate and broader surrounds of the Subject Site (within 10km). A 1500m buffer was placed around the site, totalling approximately 974.02ha in size (includes the total area of the Subject Site). Of this, approximately 508.79ha comprise native vegetation as per Section 4.3.2 of the BAM. This equates to approximately 52% native vegetation cover. Development of the site would reduce native vegetation within 1500m of the site by less than 0.01%. As discussed above in the Subject Site represents habitat for *Rhodamnia rubescens.* The size of the local population is unknown. There is 1 individual Rhodamnia proposed to be removed as a result of this development. Four (4) additional individuals were observed in the Study Area to the west of the Subject Site. There are 20 BioNet Atlas records within 10km of the Subject Site that do not include those observed by AEP during surveys. Vegetation to the west of the Subject Site represents higher quality habitat, as evidenced by the comparative presence of the species. The proposed development will clear 3.72ha of native vegetation. The retained vegetation in the west will provide higher quality habitat for the species than the poor to degraded vegetation present on the Subject Site. Therefore, the proposed future development of the site is not likely to result in a significant loss, modification or isolation of available habitat.

BAM 2017 s10.2.3 Provisions	Comment
assessor to estimate what percentage of the species' population and habitat is likely to be lost in the long term within the IBRA subregion due to the direct and indirect impacts of the development	
(e) the likely impact on the ecology of the local population. At a minimum, address the following: (i) for fauna: – breeding – foraging – roosting, and – dispersal or movement pathways (ii) for flora, address how the proposal is likely to affect the ecology and biology of any residual plant population that will remain post development including where information is available: – pollination cycle – seedbanks – recruitment, and – interactions with other species (e.g., pollinators, host species, mycorrhizal associations)	Seedling recruitment is low from *R. rubescens* with Myrtle Rust infection and the continued impact to the species will further decrease recruitment of young saplings/seedlings into mature trees. Myrtle Rust is known to significantly reduce the viability of *R. rubescens* fruit. The *R. rubescens* present on the Subject Site has been impacted by Myrtle Rust and is unlikely to produce viable fruit.
(f) a description of the extent to which the local population will become fragmented or isolated as a result of the proposed development	A single individual of *R. rubescens* will be removed by the development. The nearest patch of *R. rubescens* is located outside the Subject Site in the Study Area. The population is already fragmented. Removal of this specimen will not result in fragmentation or isolation of local population.
(g) the relationship of the local population to other population/populations of the species. This must include consideration of the interaction and importance of the local population to other population/populations for factors such as breeding, dispersal and genetic viability/diversity, and whether the local population is at the limit of the species' range	Seedling recruitment is low from Myrtle Rust infection and the continual impact to the species will further decrease recruitment of young saplings/seedlings into mature trees. Myrtle Rust is known to significantly reduce the viability of *R. rubescens* fruit. The *R. rubescens* present on the Subject Site has been impacted by Myrtle Rust and is unlikely to produce viable fruit.
(h) the extent to which the proposed development will lead to an increase in threats and indirect impacts, including impacts from invasive flora and fauna, that may in turn lead to a decrease in the viability of the local population	The proposed development would result in direct impacts on native vegetation, and potential indirect impacts from edge effects. In addition, the implementation proposed development will limit and restrict the impact of invasive flora and fauna through the implementation of the CEMP during construction and the VMP during operation.

BAM 2017 s10.2.3 Provisions	Comment
(i) an estimate of the area, or number of populations and size of populations that is in the reserve system in NSW, the IBRA region and the IBRA subregion	The size of the local population is unknown. There is one (1) individual *R. rubescens* proposed to be removed as a result of the development. Four (4) additional individuals were observed in the Study Area to the west of the Subject Site. There are 20 BioNet Atlas records within 10km of the Subject Site that do not include those observed by AEP during surveys.
(j) the measure/s proposed to contribute to the recovery of the species in the IBRA subregion.	The TSC Scientific Committee in the conservation advice for *R. rubescens* states: recovery plan for this species under the EPBC Act was not recommended, because the Approved Conservation Advice provides sufficient direction to implement priority actions and mitigate against key threats. In this advice, it is further stated that "no effective or practical chemical, biological or management control is currently available for protecting populations of *R. rubescens* in natural ecosystems from *A. psidii* infection. Repeated monthly application of registered fungicides (e.g. triadimenol) for extremely high value assets concentrated in small local areas may be feasible but is impractical for widespread control." The following management actions have been suggested by AEP (2021) for *R. rubescens* populations observed on the Central Coast: • Protect from slashing/maintenance and other edge effects along tracks • Protect from damage during subdivision, construction and property boundary maintenance by neighbours. • Reduce and maintain weed densities at low levels, as per the VMP. Only manual weeding to be undertaken within species polygon areas (no foliar spraying). Large exotic canopy trees to be poisoned and remain in-situ. • Undertake monthly primary fungicide treatment over six months for the first 5 years of management, then treatments every following 5 years. Details of suitable fungicide to control myrtle rust are contained in references within the VMP (see **Appendix L)**. • Vehicle movements only on identified access tracks.

AEP

Figure 10 - Rhodamnia Records (1500m) | Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach | BOAMS: 00030048

Client: Addenbrooke Pty Ltd | AEP ref: 2506.03

2.4.2 Impacts requiring offset

2.4.2.1 Ecosystem Credits

As per Section 10.3 of the BAM, the removal of native vegetation within the site will require offsetting to achieve the 'no net loss standard' detailed within Section 11. To calculate the required offsets in the form of ecosystem credits, the BAM Calculator has taken into consideration the impact area and the projected loss in vegetation integrity score along with the biodiversity risk weighting of the PCT. Details of each along with the required credit outputs is provided in **Table 28**. A total of 76 ecosystem credits are required to offset the proposed development.

Table 28 – Ecosystem Credit Requirements

Vegetation Zone	Impact Area (ha)	Future VIS	Vegetation Integrity Score Loss	Biodiversity Risk Weighting	Credit Requirements
PCT 1235 Poor	1.33	0	44.3	2	29
PCT 1235 Dam	0.07	0	25.5	2	1
PCT 1235 Melaleuca-dominated	0.18	0	43.3	2	4
PCT 1262 Poor	0.55	0	39.8	1.5	8
PCT1525 Poor	<0.01	0	36.8	2	1
PCT 1537 Moderate	0.13	0	65.3	2	4
PCT 1556 Poor	0.1	0	46.6	2	2
PCT 1737 Moderate	0.07	0	54.9	2	2
Total	2.62	-	-	-	51

2.4.2.2 Species Credits

If a Species Credit species is either identified on the site during survey, assumed to be present, or confirmed present within an expert report, a 'species polygon' is required to be produced for the area of suitable habitat within the site for the species. The size of this polygon is entered into the BAM Calculator, which determines the number of credits required to offset the removal of suitable habitat based upon the quality of habitat and biodiversity risk weighting of the species.

One (1) specimen of *Rhodamnia rubescens* will be impacted by the development. This specimen is in a highly degraded state, being impacted by myrtle rust and located at the base of a native paddock tree, surrounded by slashed pasture. Removal of this specimen will require 3 credits.

Little Bent-winged Bat (*Miniopterus australis*), Greater Broad-nosed Bat (*Scoteanax rueppellii*) and Southern Myotis (*Myotis macropus*) were recorded within the Subject Site during field surveys. These species are listed as 'dual credit species', meaning aspects of their habitat are incorporated within both ecosystem credits and species credits. For these species (and several others) any foraging habitat present on the site is encompassed within the required ecosystem credits for the PCT, whilst any roosting / breeding habitat requires additional offsetting in the form of Species Credits. Given the lack of hollow-bearing trees, caves and similar structures, species credits are not required for either of these species.

White-bellied Sea-Eagle (WBSE) (*Haliaeetus leucogaster*) was observed flying over the Subject Site. No nests were observed on the Subject Site, therefore no White-bellied Sea-eagle species credits will be generated.

2.4.3 Impacts not requiring offset

There are no vegetation zones on site with a VIS lower than 20. All impacts on native vegetation require offset.

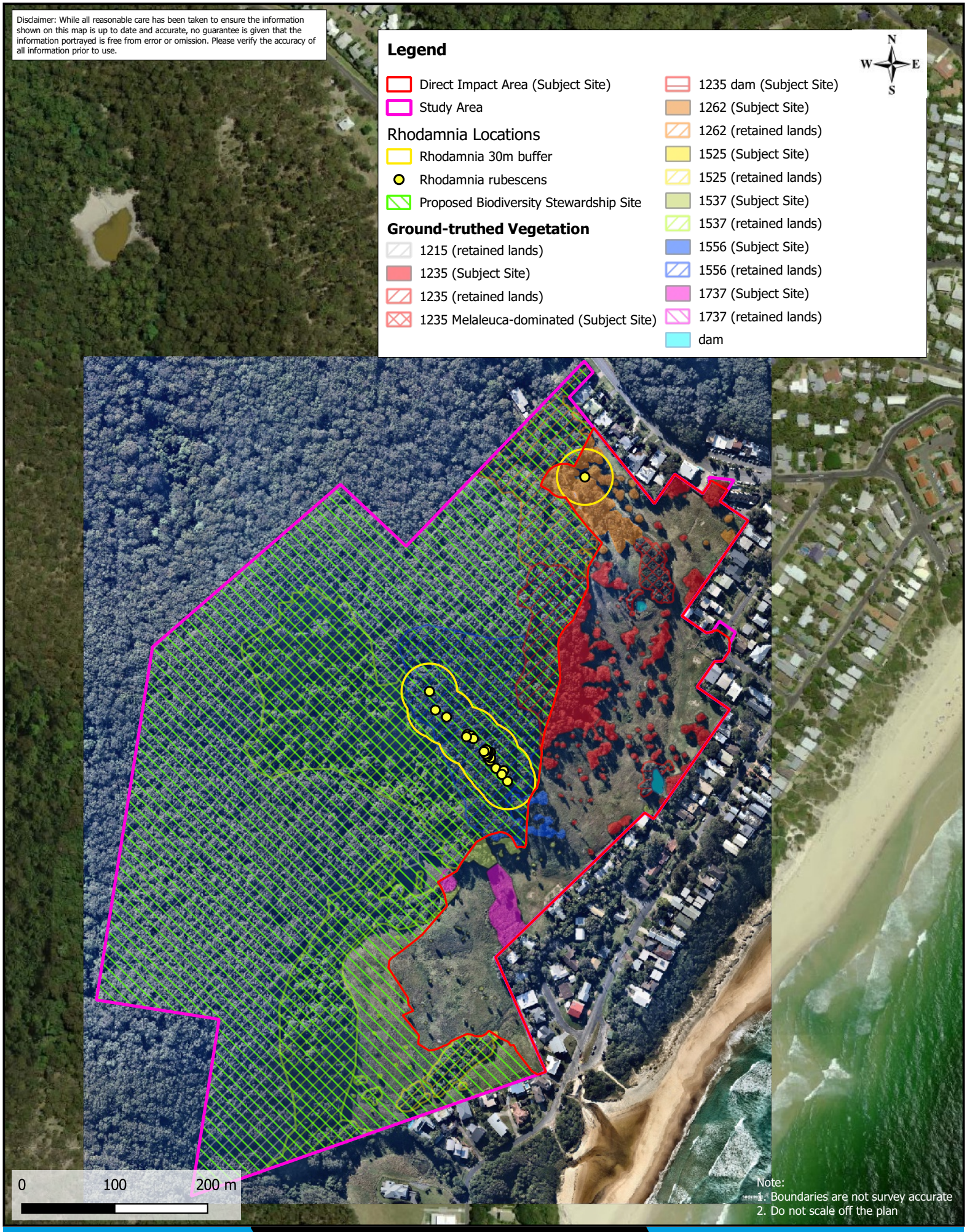
2.4.4 Areas not requiring assessment

Approximately 6.3ha of the site is already cleared, occupied by dams, or are dominated by non-native species, mainly paddock grasses. These areas have not been assessed for credits.

Figure 11 shows impacted areas in the Study Area.

2.5 Biodiversity Credit Report

The Biodiversity Credit Report generated within the BAM Calculator is provided in **Appendix G** and includes potential offset variations that are applicable to the proposal.



AEP

Figure 11 - Impact Area

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 003048

Client: Addenbrooke Pty Ltf

AEP ref: 2506.03

3.0 Conclusion

Application of the BAM against the proposal has quantified current biodiversity values within the site and calculated offset requirements for residual impacts following avoid and mitigation assessment.

The vegetation within the Subject Site was found to be commensurate with PCTs 1235, 1262, 1525, 1537, 1556 and 1737. The remainder of the site predominantly comprised non-native previously grazed pasture land.

The proposal will require the total removal of vegetation within the development footprint with the exception of the lands scheduled in the VMP. As a result, the following credit requirements were calculated within the BAM Calculator to offset the residual impacts of vegetation removal and achieve a no net loss standard.

Table 29 – Credit Requirements

Impacted Matter	Native Vegetation to be Removed (ha)	Number of Credits
PCT 1235 Poor	1.33	29
PCT 1235 Dam	0.07	1
PCT 1235 Melaleuca-dominated	0.18	4
PCT 1262 Poor	0.55	8
PCT1525 Poor	<0.01	1
PCT 1537 Moderate	0.13	4
PCT 1556 Poor	0.1	2
PCT 1737 Moderate	0.07	2
Rhodamnia rubescens	N/A	3
Total	**-**	**54**

The full biodiversity credit report is attached as **Appendix G**.

4.0 References

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Appendix A – Development Plans

Final Design

LEGEND

- LIMIT OF WORK
- PROPOSED STORMWATER (SW)
- PROPOSED SEWER (S)
- PROPOSED WATER (W)
- PROPOSED TELECOM (COM)
- PROPOSED SWALE
- PROPOSED 4.5m FRONT SETBACK
- PROPOSED 3.0m EASEMENT
- PROPOSED RETAINING WALL
- PROPOSED RAIN GARDEN

NORTH

BOOMERANG DRIVE

RHODAMNIA RUBESCENS TREE CLUSTER

NON EXCLUSION ZONE

PROPOSED POND 02

POND 02

Y4 1642m²

Y1 1457m²

POND 01 Y2 1817m²

PROPOSED POND 01

PCT1525 CLUSTER

ROAD 01

ROAD 02

ROAD 03

ROAD 04

A1 584m² | A2 581m² | A3 580m² | A4 580m² | A5 580m² | A6 1000m² | A7 925m² | A8 925m² | A9 925m²

B1 628m² | B2 635m² | B3 635m² | B4 636m² | B5 636m² | B6 620m² | B7 602m² | B8 815m²

C1 565m² | C2 565m² | C3 565m² | C4 565m² | C5 565m² | C6 565m² | C7 565m² | C8 565m²

D1 775m² | D2 747m² | D3 713m² | D4 680m² | D5 647m² | D6 630m² | D7 500m² | D8 500m² | D9 500m² | D10 657m² | D11 640m² | D12 622m² | D13 596m² | D14 558m² | D15 520m² | D16 506m² | D17 502m² | D18 500m² | D19 715m² | D20 565m² | D21 500m² | D22 513m² | D23 501m² | D24 506m² | D25 530m² | D26 570m² | D27 609m² | D28 661m² | D29 719m² | D30 755m²

E1 573m² | E2 573m² | E3 592m² | E4 590m² | E5 588m² | E6 702m² | Z2 1234m²

F1 523m² | F2 523m² | F3 591m² | F4 549m² | F5 567m² | F6 567m² | Z1 1179m²

G1 768m² | G2 680m² | G3 679m² | G4 682m² | G5 685m² | G6 808m²

CROLL STREET

PROPOSED CROLL STREET/VIEW STREET ROUNDABOUT

VIEW STREET

AMPAT PLACE

ALAMAU PL

SAMUEL ST

NEWMAN AVENUE

NEWMAN AVENUE

0 20 40 60 80 100m

SCALE 1:1000 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
C	18/08/2022	FOR DA SUBMISSION	TM/ML	GZ	JS
B	17/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS
A	09/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS

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		Date
Drawn	MPQ	09/05/2022
Checked	AS/TM	09/05/2022
Designed	TM/ML	09/05/2022
Verified	GZ	09/05/2022
Approved	JS	09/05/2022

Client: BLUEYS BEACH ESTATE

Project: BLUEYS BEACH DEVELOPMENT
BOOMERANG DRIVE, BLUEYS BEACH, NEW SOUTH WALES

Title: OVERALL GENERAL ARRANGEMENT PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Datum	Scale	Size
09/05/2022	AHD	1:1000	A1

Drawing Number: 50522033-C-1004

Revision: C

DATE PLOTTED: 17 August 2022 5:13 PM BY : MARIO QUITORIANO

XREFs: X-Base, GISextract_20211013, X-ROAD NAMES, X-Ecological Constraints; CONTS DESIGN-1000, X-Final Cad Base_Option E, X-Final Lot Areas_Option E, CONTS DESIGN EXISTING-1000, X- PROPOSED SERVICES; X-Limit of Works-BOY; X- PROPOSED STORMWATER

CAD File: N:\Projects\50\5\FY22\033_BLUEYS BEACH DA\Drawings\Build\DA\50522033-C-1004-OGA.dwg

May 2022 (1)

LEGEND

- LIMIT OF WORK
- PROPOSED STORMWATER (SW)
- PROPOSED SEWER (S)
- PROPOSED WATER (W)
- PROPOSED TELECOM (COM)
- PROPOSED ELECTRICAL
- PROPOSED SWALE
- PROPOSED 4.5m FRONT SETBACK
- PROPOSED 2m WIDE FOOTPATH
- PROPOSED 4.5m WIDE FOOTPATH
- OPTIONAL FOOTPATH LINK
- PROPOSED RAIN GARDEN
- PROPOSED 3.0m EASEMENT

NORTH

ROAD 01

ROAD 02

ROAD 03

ROAD 04

BOOMERANG DRIVE

CROLL STREET

VIEW STREET

AMPAT PLACE

ALAMAU PL.

SAMUEL ST.

NEWMAN AVENUE

FOOTPATH LINK TO BE INVESTIGATED

PROPOSED CROLL STREET/VIEW STREET ROUNDABOUT

PROPOSED STORMWATER TREATMENT ASSET

PROPOSED STORMWATER TREATMENT ASSET

SCALE 1:1000 @A1

0 20 40 60 80 100m

DATE PLOTTED: 12 July 2022 12:40 PM BY : JOHN SUTCLIFFE

XREF's: X-Base_GISextract_20211013; X-Contours_GISextract_20211013; X-Limit of Works-BDY; X-Lot Areas_Option D-500; X-Cad Base_Option D; CONTS DESIGN-1000; X-Lot Areas_Option D; X-ROAD NAMES

CAD File: N:\Projects\505\FY22\033_BLUEYS BEACH DA\Drawings\Build\DA\50522033-C-1004-OGA.dwg

Rev.	Date	Description	Des.	Verif.	Appd.
B	17/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS
A	09/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS

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		Date
Drawn	MPQ	09/05/2022
Checked	AS/TM	09/05/2022
Designed	TM/ML	09/05/2022
Verified	GZ	09/05/2022
Approved	JS	09/05/2022

Client: BLUEYS BEACH ESTATE

Project: BLUEYS BEACH DEVELOPMENT
BOOMERANG DRIVE, BLUEYS BEACH, NEW SOUTH WALES

Title: OVERALL GENERAL ARRANGEMENT PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

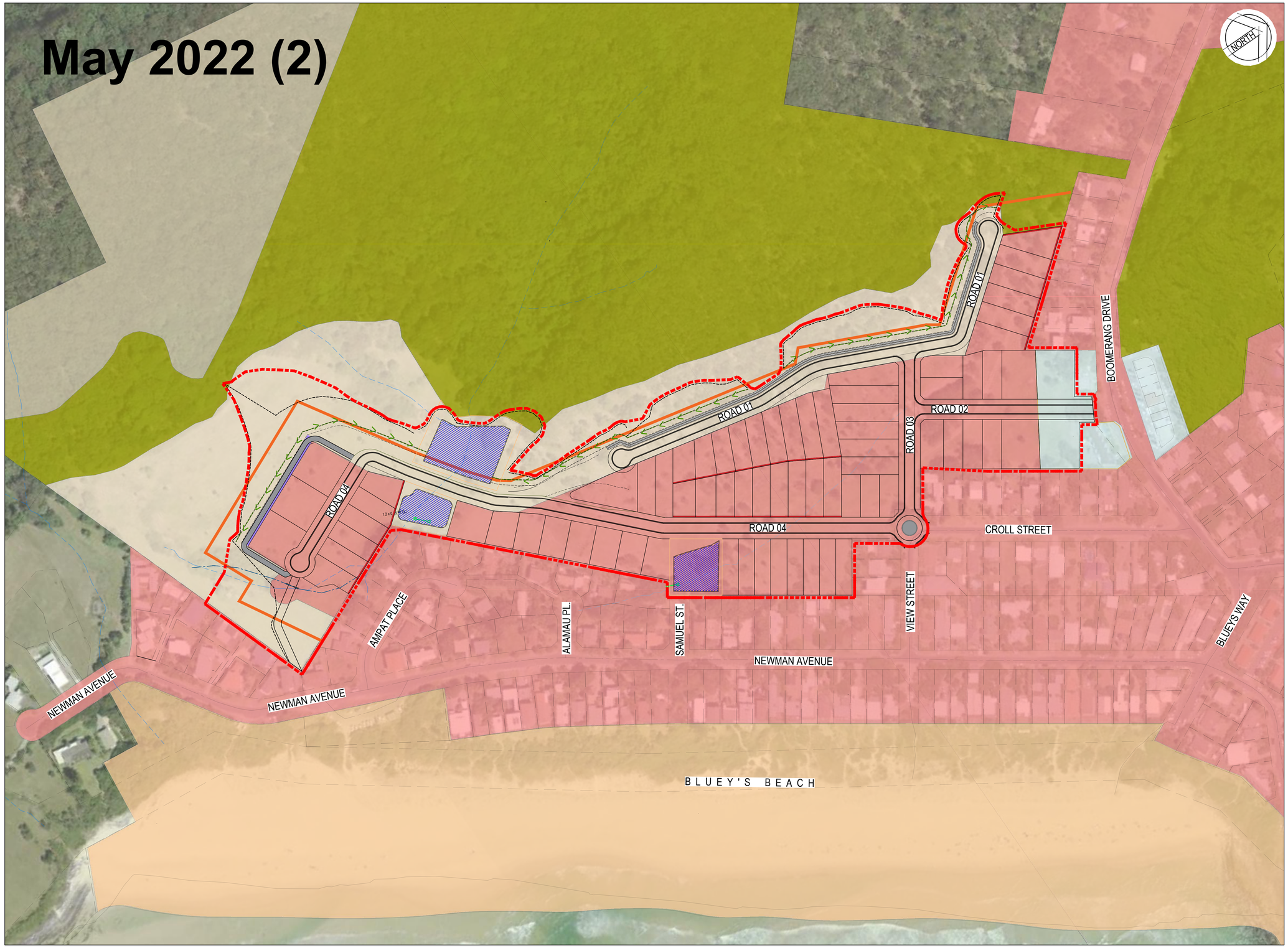
Date	Datum	Scale	Size
09/05/2022	AHD	1:1000	A1

Drawing Number: 50522033-C-1004

Revision: B

DATE PLOTTED: 22 June 2022 8:44 PM BY : MA. LORENA OLAZO

May 2022 (2)



LEGEND

- LIMIT OF WORK
- 25m APZ
- B1 - Neighbourhood Centre
- E2- Environmental Conservation
- E3 - Environmental Management
- E4 - Environmental Living
- R2 - Low Density Residential
- RU2 - Rural Landscape

0 50 100 150m

SCALE 1:1500 @A1

Rev.	Date	Description	Des.	Verif.	Appd.
B	17/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS
A	09/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS

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Drawn	MPQ	Date 09/05/2022
Checked	AS/TM	Date 09/05/2022
Designed	TM/ML	Date 09/05/2022
Verified	GZ	Date 09/05/2022
Approved	JS	09/05/2022

Client: BLUEYS BEACH ESTATE

Project: BLUEYS BEACH DEVELOPMENT
BOOMERANG DRIVE, BLUEYS BEACH, NEW SOUTH WALES

Title: BUSHFIRE ASSET PROTECTION PLAN

Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Datum	Scale	Size
09/05/2022	AHD	1:1500	A1

Drawing Number: 50522033-C-1011

Revision: B

XREFs: X-Base_GISextract_20211013, X-Contours_GISextract_20211013, X-Land Zoning_Option C, X-Limit of Works-BDY-1500, X-Cad Base_Option D, X-ROAD NAMES, X-Lot Areas_Option D
CAD File: N:\Projects\505\FY22\033_BLUEYS BEACH DA\Drawings\Build\DA\50522033-C-1011-BAP.dwg

Appendix B – Flora Species List

Family	Scientific Name	Common Name
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower
Acanthaceae	*Brunoniella australis*	Blue Trumpet
Adiantaceae	*Adiantum hispidulum*	Rough Maidenhair
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed
Apiaceae	*Centella asiatica*	Swamp Pennywort
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
Apiaceae	*Hydrocotyle tripartita*	Pennywort
Apocynaceae	*Gomphocarpus fruiticosus**	Narrow Leaf Cotton Bush
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Araceae	*Gymnostachys anceps*	Settlers Flax
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
Araliaceae	*Astrotricha latifolia*	Broad-leaf Star-hair
Araliaceae	*Polyscias elegans*	Celery Wood
Araliaceae	*Heptapleurum actinophyllum**	Umbrella Tree
Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Asparagaceae	*Liriope sp.**	
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Conyza sp.**	A Fleabane
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Ageratina adenophora**	Crofton Weed
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata**	Bitou Bush
Asteraceae	*Euchiton sp.*	A Cudweed
Asteraceae	*Sonchus oleraceus**	Common Sow-thistle
Asteraceae	*Taraxacum officinale**	Dandelion
Asteraceae	*Euchiton sphaericus*	
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed
Asteraceae	*Ageratum houstonianum**	Blue Billy Goat Weed
Asteraceae	*Conyza sumatrensis**	Tall Fleabane
Asteraceae	*Cyanthillium cinereum var. cinereum**	Purple Fleabane
Bignoniaceae	*Pandorea pandorana*	Wonga Vine
Blechnaceae	*Doodia aspera*	Prickly Rasp Fern
Blechnaceae	*Blechnum sp.*	
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew
Commelinaceae	*Pollia crispata*	Pollia
Convolvulaceae	*Dichondra repens*	Kidney Weed
Convolvulaceae	*Polymeria calycina*	Bindweed
Cunoniaceae	*Ceratopetalum gummiferum*	NSW Christmas Bush
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge

Family	Scientific Name	Common Name
Cyperaceae	*Gahnia aspera*	Saw Sedge
Cyperaceae	*Cyperus sesquiflorus**	
Cyperaceae	*Cyperus polystachyos*	
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Cyperaceae	*Eleocharis sphacelata*	Tall Spike-rush
Cyperaceae	*Schoenoplectiella mucronata*	River Clubrush
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-rush
Cyperaceae	*Carex appressa*	Tall Sedge
Cyperaceae	*Gahnia melanocarpa*	Black-fruit Saw-sedge
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dennstaedtiaceae	*Histiopteris incisa*	Bat's Wing Fern
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower
Dioscoreaceae	*Dioscorea transversa*	Native Yam
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart
Fabaceae	*Senna pendula var. glabrata**	
Fabaceae	*Acacia longifolia*	
Fabaceae	*Trifolium repens**	White Clover
Fabaceae	*Acacia elongata*	Swamp Wattle
Fabaceae	*Grona varians*	Slender Tick-trefoil
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea
Fabaceae	*Glycine tabacina*	Twining Glycine
Fabaceae	*Acacia longifolia var. longifolia*	Sydney Golden Wattle
Fabaceae	*Glycine clandestina*	Twining Glycine
Fabaceae	*Hardenbergia violacea*	False Sarsparilla
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil
Fabaceae	*Acacia longifolia var. sophorae*	Coastal Wattle
Flacourtiaceae	*Scolopia braunii*	Flintwood
Goodeniaceae	*Goodenia stelligera*	Spiked Goodenia
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Iridaceae	*Sisyrinchium iridifolium**	Blue Pigroot
Juncaceae	*Juncus bufonius*	Toad Rush
Juncaceae	*Juncus usitatus*	Common Rush
Juncaceae	*Juncus planifolius*	Broad Rush
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower
Lauraceae	*Neolitsea australiensis*	Green Bolly Gum
Lauraceae	*Neolitsea dealbata*	White Bolly Gum, Hairy-leaved Bolly Gum
Lobeliaceae	*Lobelia purpurascens*	Whiteroot
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush

Family	Scientific Name	Common Name
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush
Loranthaceae	*Dendrophthoe vitellina*	Mistletoe
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
Lycopodiaceae	*Lycopodium sp.*	
Malaceae	*Rhaphiolepis indica**	Indian Hawthorn
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Meliaceae	*Synoum glandulosum subsp. glandulosum*	Scentless Rosewood
Menispermaceae	*Stephania japonica*	Snake vine
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine
Menyanthaceae	*Nymphaea caerulea subsp. zanzibarensis**	Cape Waterlily
Monimiaceae	*Wilkiea huegeliana*	Wilkiea, Veiny Wilkiea
Monimiaceae	*Daphnandra apatela*	
Moraceae	*Streblus brunonianus*	Whalebone Tree
Moraceae	*Ficus coronata*	Sandpaper Fig
Moraceae	*Ficus fraseri*	Sandpaper Fig
Moraceae	*Ficus microcarpa**	Hill's Weeping Fig
Moraceae	*Ficus obliqua*	Small-leaved Fig
Moraceae	*Ficus sp.**	
Myrsinaceae	*Myrsine variabilis*	Muttonwood
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Austromyrtus dulcis*	Midgen Berry
Myrtaceae	*Baloghia inophylla*	Brush Bloodwood
Myrtaceae	*Callistemon linearis*	Narrow-leaved Bottlebrush
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush
Myrtaceae	*Eucalyptus canaliculata*	Large Fruited Grey Gum
Myrtaceae	*Eucalyptus microcorys*	Tallowwood
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Myrtaceae	*Eucalyptus propinqua*	Small Fruited Grey Gum
Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Myrtaceae	*Lophostemon confertus*	Brush Box
Myrtaceae	*Melaleuca ericifolia*	Swamp Paperbark
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine
Myrtaceae	*Syzygium oleosum*	Blue lillypilly
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive
Oleaceae	*Notelaea ovata*	Mock Olive
Oleaceae	*Notelaea sp.*	
Orchidaceae	*Cymbidium suave*	Snake Orchid
Orchidaceae	*Epidendrum sp.**	
Orchidaceae	*Spiranthes australis*	Ladies' Tresses

Family	Scientific Name	Common Name
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorrel
Passifloraceae	*Passiflora caerulea**	Passionfruit
Passifloraceae	*Passiflora herbertiana*	Native Passionfruit
Philydraceae	*Philydrum lanuginosum*	Woolly Frogmouth
Phormiaceae	*Dianella caerulea var. producta*	Blue Flax Lily
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree
Phyllanthaceae	*Glochidion ferdinandii*	Cheese Tree
Phyllanthaceae	*Phyllanthus hirtellus*	Thyme Spurge
Phyllanthaceae	*Poranthera microphylla*	Small Poranthera
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry
Plantaginaceae	*Veronica plebeia*	Creeping Speedwell
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Oplismenus aemulus*	Basket Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Cenchrus clandestinum**	Kikuyu
Poaceae	*Setaria sp.**	
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Oplismenus imbecillis*	
Poaceae	*Paspalum mandiocanum**	Broadleaf Paspalum
Poaceae	*Digitaria sanguinalis**	Crab Grass
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Digitaria sp.**	A Finger Grass
Poaceae	*Paspalum orbiculare*	Ditch Millet
Poaceae	*Themeda triandra*	Kangaroo Grass
Poaceae	*Briza maxima**	Quaking Grass
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass
Poaceae	*Ehrharta erecta**	Panic Veldtgrass
Poaceae	*Echinopogon caespitosus var. caespitosus*	Tufted Hedgehog Grass
Poaceae	*Setaria sphacelata**	South African Pigeon Grass
Poaceae	*Chloris gayana**	Rhodes Grass
Poaceae	*Eragrostis sp.**	Lovegrass
Poaceae	*Poa labillardierei subsp. nervosa*	
Poaceae	*Poa labillardierei var. labillardierei*	Tussock Grass
Poaceae	*Rytidosperma sp.*	
Poaceae	*Chloris sp.**	
Poaceae	*Cymbopogon refractus*	Barbwire Grass

Family	Scientific Name	Common Name
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Polygonaceae	*Rumex crispus**	Curled Dock
Polygonaceae	*Persicaria decipiens*	Slender Knotweed
Polygonaceae	*Persicaria subsessilis*	Hairy Knotweed
Polypodiaceae	*Platycerium bifurcatum*	Elkhorn
Portulacaceae	*Portulaca oleracea*	Purslane
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel
Primulaceae	*Lysimachia arvensis var. caerulea**	Blue Pimpernel
Proteaceae	*Banksia integrifolia*	Coast Banksia
Pteridaceae	*Cheilanthes sieberi*	Rock Fern
Putranjivaceae	*Drypetes deplanchei*	Yellow Tulipwood
Ranunculaceae	*Clematis aristata*	Old Man's Beard
Ranunculaceae	*Ranunculus productus*	
Ranunculaceae	*Ranunculus inundatus*	River Buttercup
Rhamnaceae	*Pomaderris ferruginea*	Rusty Pomaderris
Rosaceae	*Rubus rosifolius*	Forest Bramble
Rosaceae	*Rubus moluccanus*	Broad-leaf Bramble
Rosaceae	*Rubus anglocandicans**	Blackberry
Rubiaceae	*Gynochthodes jasminoides*	Sweet Morinda
Rubiaceae	*Coprosma repens**	New Zealand Laurel
Rubiaceae	*Richardia humistrata**	
Rubiaceae	*Pomax umbellata*	Pomax
Rubiaceae	*Opercularia diphylla*	
Rubiaceae	*Psychotria loniceroides*	Hairy Psychotria
Rutaceae	*Melicope micrococca*	White Euodia, Hairy-leaved Doughwood
Santalaceae	*Exocarpos sp.*	
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Sapindaceae	*Diploglottis australis*	Native Tamarind
Sapindaceae	*Guioa semiglauca*	Guioa
Sapindaceae	*Alectryon subcinereus*	Native Quince
Sapotaceae	*Planchonella australis*	Black Apple
Smilacaceae	*Smilax australis*	Lawyer Vine
Smilacaceae	*Ripogonum album*	White Supplejack
Smilacaceae	*Smilax glyciphylla*	Sarsaparilla
Solanaceae	*Solanum chenopodioides**	Whitetip Nightshade
Solanaceae	*Solanum mauritianum**	Wild Tobacco
Sterculiaceae	*Commersonia fraseri*	Brush Kurrajong
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower
Typhaceae	*Typha orientalis*	Cumbungi
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Verbena sp.**	
Verbenaceae	*Verbena officinalis**	Common Verbena
Verbenaceae	*Verbena x brasiliensis**	Gin Case

Family	Scientific Name	Common Name
Verbenaceae	*Verbena incompta**	
Violaceae	*Viola sp.*	
Violaceae	*Viola banksii*	
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Vitaceae	*Cissus hypoglauca*	Water Vine
Vitaceae	*Cissus antarctica*	Kangaroo Vine
Vitaceae	*Cayratia clematidea*	Native Grape
Zamiaceae	*Macrozamia communis*	Burrawang
Zingiberaceae	*Alpinia caerulea*	Native Ginger

* Denotes a non-native species.

Appendix C – Expected Fauna Species

EXPECTED FAUNA SPECIES LIST

The following list includes fauna species that could be reasonably expected to occur on or over the Study Area at some point, given site attributes and location.

Observations are denoted by the method of observation following the BioNet Atlas convention of recording, Survey: Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)

Bat Records - Observed (O), Definitely (D) Possible or within Species Group (P) Likely (L)

Remote Equipment - Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)* - Introduced species

? - Unconfirmed record, anecdotal records, etc.

A - NSW Atlas of Wildlife record of threatened species for the site.

Additional notes are included as to whether equipment was used to obtain the observation.

Threatened species listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are indicated in bold font.

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Amphibia			
Adelotus brevis	Tusked Frog		
Crinia signifera	Common Eastern Froglet	O, W	
Limnodynastes dumerilii	Eastern Banjo Frog		
Limnodynastes peronii	Brown-striped Frog	O, W	
Limnodynastes tasmaniensis	Spotted Grass Frog	O, W	
Litoria brevipalmata	**Green-thighed Frog**		
Litoria caerulea	Green Tree Frog		
Litoria aurea	**Green and Golden Bell Frog**		
Litoria dentata	Bleating Tree Frog		
Litoria fallax	Eastern Dwarf Tree Frog	O, W	
Litoria freycineti	Freycinet's Frog		
Litoria gracilenta	Dainty Green Tree Frog		
Litoria jervisiensis	Jervis Bay Tree Frog		
Litoria latopalmata	Broad-palmed Frog		
Litoria peronii	Peron's Tree Frog		
Litoria revelata	Revealed Frog		
Litoria tyleri	Tyler's Tree Frog		
Platyplectrum ornatum	Ornate Burrowing Frog		
Pseudophryne coriacea	Red-backed Toadlet		
Uperoleia fusca	Dusky Toadlet		
Uperoleia laevigata	Smooth Toadlet		
Aves			
Acanthiza lineata	Striated Thornbill		
Acanthiza nana	Yellow Thornbill		
Acanthiza pusilla	Brown Thornbill		
Acanthiza reguloides	Buff-rumped Thornbill		
Acanthorhynchus tenuirostris	Eastern Spinebill	O	
Accipiter cirrocephalus	Collared Sparrowhawk		
Accipiter fasciatus	Brown Goshawk		
Accipiter novaehollandiae	Grey Goshawk		
*Acridotheres tristis**	Common Myna		
Acrocephalus australis	Australian Reed-Warbler		
Aegotheles cristatus	Australian Owlet-nightjar		
Ailuroedus crassirostris	Green Catbird		
Alectura lathami	Australian Brush-turkey	O	CT
Alisterus scapularis	Australian King-Parrot		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Anas castanea	Chestnut Teal		
Anas gracilis	Grey Teal		
*Anas platyrhynchos**	Mallard		
Anas superciliosa	Pacific Black Duck		
Anhinga novaehollandiae	Australasian Darter		
Anthochaera carunculata	Red Wattlebird	O, W	CT, SM
Anthochaera chrysoptera	Little Wattlebird	O, W	SM
Aquila audax	Wedge-tailed Eagle	O	
Ardea intermedia	Intermediate Egret	O	
Ardea pacifica	White-necked Heron		
Artamus cyanopterus cyanopterus	**Dusky Woodswallow**		
Artamus leucoryn	White-breasted Woodswallow		
Aviceda subcristata	Pacific Baza		
Aythya australis	Hardhead		
Bubulcus ibis	Cattle Egret		
Butorides striata	Striated Heron		
Cacatua galerita	Sulphur-crested Cockatoo		
Cacatua sanguinea	Little Corella		
Cacomantis flabelliformis	Fan-tailed Cuckoo	O	
Cacomantis variolosus	Brush Cuckoo		
Calidris melanotos	Pectoral Sandpiper		
Caligavis chrysops	Yellow-faced Honeyeater	O	
Callocephalon fimbriatum	**Gang-gang Cockatoo**		
Calyptorhynchus lathami	**Glossy Black-Cockatoo**		
Casmerodius modesta	Eastern Great Egret		
Centropus phasianinus	Pheasant Coucal	O, W	CT, SM
Ceyx azureus	Azure Kingfisher	O	
Chalcites basalis	Horsfield's Bronze-Cuckoo		
Chalcites lucidus	Shining Bronze-Cuckoo		
Chalcophaps indica	Emerald Dove		
Charadrius bicinctus	Double-banded Plover		
Charadrius ruficapillus	Red-capped Plover		
Chelodina longicollis	Eastern Snake-necked Turtle		
Chenonetta jubata	Australian Wood Duck		
Cincloramphus timoriensis	Tawny Grassbird		
Circus approximans	Swamp Harrier		
Circus assimilis	**Spotted Harrier**		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Cisticola exilis	Golden-headed Cisticola		
Climacteris picumnus victoriae	**Brown Treecreeper (eastern subspecies)**		
Colluricincla harmonica	Grey Shrike-thrush		
Columba leucomela	White-headed Pigeon	O	
*Columba livia**	Rock Dove		
Coracina lineata	**Barred Cuckoo-shrike**		
Coracina novaehollandiae	Black-faced Cuckoo-shrike	O	
Coracina papuensis	White-bellied Cuckoo-shrike		
Corcorax melanorhamphos	White-winged Chough		
Cormobates leucophaea	White-throated Treecreeper		
Corvus coronoides	Australian Raven	O, W	CT, SM
Corvus orru	Torresian Crow		
Corvus tasmanicus	Forest Raven		
Cracticus nigrogularis	Pied Butcherbird	O, W	CT, SM
Cracticus torquatus	Grey Butcherbird	W	SM
Dacelo novaeguineae	Laughing Kookaburra	O, W	CT, SM
Daphoenositta chrysoptera	**Varied Sittella**		
Dicaeum hirundinaceum	Mistletoebird		
Dicrurus bracteatus	Spangled Drongo	O	
Edolisoma tenuirostris	Cicadabird		
Egretta garzetta	Little Egret		
Egretta novaehollandiae	White-faced Heron		
Egretta sacra	Eastern Reef Egret		
Elanus axillaris	Black-shouldered Kite		
Entomyzon cyanotis	Blue-faced Honeyeater	O	
Eolophus roseicapilla	Galah	W	SM
Eopsaltria australis	Eastern Yellow Robin	O	CT
Ephippiorhynchus asiaticus	Black-necked Stork		
Eudynamys orientalis	Eastern Koel	O, W	SM
Eurostopodus mystacalis	White-throated Nightjar		
Eurystomus orientalis	Dollarbird	O	
Falco berigora	Brown Falcon		
Falco cenchroides cenchroides	Nankeen Kestrel		
Falco longipennis	Australian Hobby		
Falco peregrinus	Peregrine Falcon		
Falcunculus frontatus frontatus	Eastern Shrike-tit		
Gallinula tenebrosa	Dusky Moorhen		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Geopelia humeralis	Bar-shouldered Dove		
Gerygone mouki	Brown Gerygone		
Gerygone olivacea	White-throated Gerygone		
Gliciphila melanops	Tawny-crowned Honeyeater		
Glossopsitta pusilla	Little Lorikeet	O	
Grallina cyanoleuca	Magpie-lark	O	
Gymnorhina tibicen	Australian Magpie	O, W	CT, SM
Haliaeetus leucogaster	**White-bellied Sea-Eagle**	O	
Haliastur indus	Brahminy Kite		
Haliastur sphenurus	Whistling Kite		
Heteroscenes pallidus	Pallid Cuckoo		
Hieraaetus morphnoides	**Little Eagle**		
Hirundapus caudacutus	**White-throated Needletail**	O	
Hirundo neoxena	Welcome Swallow	O	
Hypotaenidia philippensis	Buff-banded Rail		
Leucosarcia melanoleuca	Wonga Pigeon	O	
Lophoictinia isura	**Square-tailed Kite**		
Lopholaimus antarcticus	Topknot Pigeon		
Macropygia phasianella	Brown Cuckoo-Dove		
Malurus cyaneus	Superb Fairy-wren	O	
Malurus lamberti	Variegated Fairy-wren		
Manorina melanocephala	Noisy Miner	O, W	SM
Meliphaga lewinii	Lewin's Honeyeater	O	CT
Melithreptus lunatus	White-naped Honeyeater		
Merops ornatus	Rainbow Bee-eater		
Microeca fascinans	Jacky Winter		
Monarcha melanopsis	Black-faced Monarch		
Morus serrator	Australasian Gannet		
Myiagra cyanoleuca	Satin Flycatcher		
Myiagra rubecula	Leaden Flycatcher		
Myzomela sanguinolenta	Scarlet Honeyeater		
Neochmia temporalis	Red-browed Finch	O	CT
Neophema pulchella	**Turquoise Parrot**		
Neosericornis citreogularis	Yellow-throated Scrubwren	O	CT
Ninox connivens	**Barking Owl**		
Ninox novaeseelandiae	Southern Boobook		
Ninox strenua	**Powerful Owl**		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Nycticorax caledonicus	Nankeen Night Heron		
Ocyphaps lophotes	Crested Pigeon	O	CT
Oriolus sagittatus	Olive-backed Oriole	O	
Pachycephala pectoralis	Golden Whistler	O	
Pachycephala rufiventris	Rufous Whistler		
Pandion cristatus	Eastern Osprey		
Pardalotus punctatus	Spotted Pardalote		
Pelecanus conspicillatus	Australian Pelican		
Petrochelidon nigricans	Tree Martin		
Petroica boodang	**Scarlet Robin**		
Petroica rosea	Rose Robin		
Philemon citreogularis	Little Friarbird		
Philemon corniculatus	Noisy Friarbird	O	
Phylidonyris niger	White-cheeked Honeyeater	O	
Phylidonyris novaehollandiae	New Holland Honeyeater		
Platalea regia	Royal Spoonbill		
Platycercus elegans	Crimson Rosella		
Platycercus eximius	Eastern Rosella	O	
Podargus strigoides	Tawny Frogmouth		
Porphyrio porphyrio	Purple Swamphen		
Psophodes olivaceus	Eastern Whipbird	O	CT
Ptilinopus magnificus	Wompoo Fruit-Dove		
Ptilinopus superbus	**Superb Fruit-Dove**		
Ptilonorhynchus violaceus	Satin Bowerbird	O	CT
Ptilotula fusca	Fuscous Honeyeater		
Rhipidura albiscapa	Grey Fantail	O	
Rhipidura leucophrys	Willie Wagtail	O	
Rhipidura rufifrons	Rufous Fantail		
Scythrops novaehollandiae	Channel-billed Cuckoo		
Sericornis frontalis	White-browed Scrubwren	O	CT
Sericornis magnirostra	Large-billed Scrubwren		
Sericulus chrysocephalus	Regent Bowerbird		
Sphecotheres vieilloti	Australasian Figbird	O	
*Spilopelia chinensis**	Spotted Turtle-Dove		
Stipiturus malachurus	Southern Emu-wren		
Stagonopleura guttata	**Diamond Firetail**		
Stictonetta naevosa	**Freckled Duck**		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Stizoptera bichenovii	Double-barred Finch		
Strepera graculina	Pied Currawong	O, W	SM
*Sturnus vulgaris**	Common Starling		
Synoicus ypsilophora	Brown Quail		
Tachybaptus novaehollandiae	Australasian Grebe		
Taeniopygia guttata	Zebra Finch		
Threskiornis moluccus	Australian White Ibis		
Threskiornis spinicollis	Straw-necked Ibis		
Todiramphus macleayii	Forest Kingfisher		
Todiramphus sanctus	Sacred Kingfisher		
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	W	SM
Trichoglossus haematodus	Rainbow Lorikeet	O	
Tyto javanica	Eastern Barn Owl		
Tyto longimembris	**Eastern Grass Owl**		
Tyto novaehollandiae	**Masked Owl**		
Tyto tenebricosa	**Sooty Owl**		
Vanellus miles	Masked Lapwing	O,W	SM
Zanda funereus	Yellow-tailed Black-Cockatoo	W	
Zosterops lateralis	Silvereye		
Mammalia			
Acrobates pygmaeus	Feathertail Glider		
Antechinus flavipes	**Yellow-footed Antechinus**		
Antechinus mimetes	Mainland Dusky Antechinus		
Antechinus stuartii	Brown Antechinus	O	CT
Austronomus australis	White-striped Freetail-bat		
*Bos taurus**	European cattle		
*Canis familiaris**	Dog		
Canis lupus dingo	Dingo		
*Cervus timorensis**	Rusa Deer		
Chalinolobus gouldii	Gould's Wattled Bat	O	A
Chalinolobus morio	Chocolate Wattled Bat	O	A
Dasyurus maculatus	**Spotted-tailed Quoll**		
*Equus caballus**	Horse		
Falsistrellus tasmaniensis	Eastern False Pipistrelle	O	A
*Felis catus**	Cat		
Isoodon macrourus	Northern Brown Bandicoot	O	CT
*Lepus capensis occidentalis**	Hare		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Macropus giganteus	Eastern Grey Kangaroo	O	
Melomys burtoni	Grassland Melomys		
Micronomus norfolkensis	**Eastern Coastal Free-tailed Bat**	O	A
Miniopterus australis	**Little Bent-winged Bat**	O	A
Miniopterus orianae oceanensis	**Large Bent-winged Bat**		
Myotis macropus	**Large-footed Myotis**	P	
*Mus musculus**	House Mouse		
Notamacropus rufogriseus	Red-necked Wallaby	O	
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	
Nyctophilus gouldi	Gould's Long-eared Bat	P	
Ozimops ridei	Eastern Free-tailed Bat	L	
Perameles nasuta	Long-nosed Bandicoot	O	CT
Petauroides volans	**Greater Glider**		
Petaurus australis	**Yellow-bellied Glider**		
Petaurus breviceps	Sugar Glider		
Phascolarctos cinereus	**Koala**		
Pteropus poliocephalus	**Grey-headed Flying-fox**		
Pseudocheirus peregrinus	Common Ringtail Possum		
Pseudomys gracilicaudatus	Eastern Chestnut Mouse		
Pteropus poliocephalus	**Grey-headed Flying-fox**		
Rattus fuscipes	Bush Rat		
Rattus lutreolus	Swamp Rat		
*Rattus rattus**	Black Rat	O	CT
Rhinolophus megaphyllus	Eastern Horseshoe-bat		
Scoteanax rueppellii	**Greater Broad-nosed Bat**	O	A
Scotorepens orion	Eastern Broad-nosed Bat	P	
Scotorepens sp 1	Central-eastern Broad-nosed Bat		
Sminthopsis murina	Common Dunnart		
Tachyglossus aculeatus	Short-beaked Echidna		
Thylogale thetis	**Red-necked Pademelon**		
Trichosurus caninus	Short-eared Possum		
Trichosurus vulpecula	Common Brushtail Possum	O	CT
Vespadelus darlingtoni	Large Forest Bat		
Vespadelus pumilus	Eastern Forest Bat	O	A
Vespadelus troughtoni	Eastern Cave Bat	P	
Vespadelus vulturnus	Little Forest Bat	P	
Vombatus ursinus	Bare-nosed Wombat		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
*Vulpes vulpes**	Fox		
Wallabia bicolor	Swamp Wallaby	O	
Reptilia			
Acanthophis antarcticus	Common Death Adder		
Amphibolurus muricatus	Jacky Lizard		
Bellatorias major	Land Mullet		
Cacophis krefftii	Southern Dwarf Crowned Snake		
Cacophis squamulosus	Golden-crowned Snake		
Cryptophis nigrescens	Eastern Small-eyed Snake		
Cyclodomorphus gerrardii	Pink-tongued Lizard		
Demansia psammophis	Yellow-faced Whip Snake		
Dendrelaphis punctulatus	Common Tree Snake	O	
Hemiaspis signata	Black-bellied Swamp Snake		
Hoplocephalus stephensii	Stephens' Banded Snake		
Intellagama lesueurii	Eastern Water Dragon		
Lampropholis delicata	Dark-flecked Garden Sunskink	O	
Lampropholis guichenoti	Pale-flecked Garden Sunskink		
Morelia spilota spilota	Diamond Python	O	
Pogona barbata	Bearded Dragon		
Pseudechis porphyriacus	Red-bellied Black Snake	O	
Pseudonaja textilis	Eastern Brown Snake		
Pygopus lepidopodus	Common Scaly-foot		
Saiphos equalis	Three-toed Skink		
Tiliqua scincoides	Eastern Blue-tongue		
Varanus varius	Lace Monitor	O	CT
Vermicella annulata	Bandy-bandy		

Appendix D – Important Areas for Habitat Maps

Planning, Industry & Environment

Important Areas for Habitat Mapping

Map may contain errors and omissions. Neither the NSW Government nor any other data custodian will accept liability for any loss, damage, or cost incurred as a result of the use of, or reliance upon, the information in the map. Map copyright the State of NSW through the Department of Planning, Industry & Environment.

Legend

- Swift Parrot Important Areas
- Migratory Shorebird Important Areas
- Regent Honeyeater Important Areas
- Plains-wanderer Important Areas
- DPEBasemap

0 1.4 2.8 5.5

Kilometres

Map Created 10:42 AM 9/8/2022

Appendix E – Field Survey Effort

Summary of Field Survey Effort

Date	Time	Field Activity	Personnel on Site
23/11/2021	12:00 – 16:30	Diurnal Bird Survey Targeted flora survey: *Rhizanthella slateri, Maundia triglochinoides, Pterostylis chaetophora, Grevillea parviflora* Incidentals	1
26/11/2021	8:20 – 10:40	Diurnal bird survey Incidentals	1
30/11/2021	10:00 – 17:00 19:45 – 21:00	3x BAM plots General site observation for habitat, vegetation condition Targeted frog survey for: *Litoria aurea, Litoria brevipalmata, Uperoleia mahonyi, Crinia tinnula, Mixophyes iteratus* Incidentals	2
01/12/2021	10:00 – 17:00 19:45 – 21:00	2 x BAM plots General site observation for habitat, vegetation condition Targeted frog survey for: *Litoria aurea, Litoria brevipalmata, Uperoleia mahonyi* *Crinia tinnula Mixophyes iteratus,* Incidentals	2
12/01/2022	10:45 – 21:30	Habitat-bearing tree survey Equipment deployment (12 cameras, 1 Songmeter, 1 Anabat) Nocturnal survey, call playback targeting: *Phascogale, Planigale, Bush-Stone Curlew, Koala* Incidentals	1
13/01/2022	07:30 – 13:45	Diurnal bird survey: *Bush-stone Curlew, Glossy-Black Cockatoo, Gang-gang Cockatoo* Anabat deployment 3x Koala SAT surveys Incidentals	1
27/01/2022	11:30 – 16:40	Equipment rebaits and battery refresh Incidentals	1
02/02/2022	0915 – 1515	2 BAM Plots Targeted Flora surveys for: *Melaleuca biconvexa, Angophora inopina, Eucalyptus parramattensis subsp. Decadens, Melaleuca groveana, Grevillea guthrieana, Rhodomyrtus psidioides, Rhodamnia rubescens, Pomaderris queenslandica, Eucalyptus glaucina Senna acclinis, Persicaria elatior, Lindernia alsinoides, Maundia triglochinoides* Incidentals	2
03/02/2022	09:00 – 15:00	Targeted Flora surveys for: *Melaleuca biconvexa, Angophora inopina, Eucalyptus parramattensis subsp. decadens, Melaleuca groveana Grevillea guthrieana, Rhodomyrtus psidioides, Rhodamnia rubescens, Pomaderris queenslandica, Eucalyptus glaucina Senna acclinis, Persicaria elatior, Lindernia alsinoides, Maundia triglochinoides* 2 x BAM Plots Incidentals	2

Date	Time	Field Activity	Personnel on Site
08/02/2022	10:00 – 16:00	Equipment retrieval 3 x BAM plots Nocturnal surveys targeting koalas Incidentals	2
09/02/2022	14:25 – 16:00 19:45 – 20:30	8x RDPs in retained lands *Livistona australis* waypointing Nocturnal surveys targeting koalas Incidentals	2
15/07/2022	10:20 – 16:15	Additional targeted flora survey for *Rhodamnia rubescens*	2
02/08/2022	9:30 – 15:00	Targeted flora transects for *Diuris praecox* and *Dendrobium melaleucaphilum*	2

Appendix F – BAM Plot Field Data Sheets

	Job number: 2506	Site: Blueys	Plot ID: P01	Bearing: 150	Observers: FOB, DK
Start point Easting / Northing: 0456161 6420832			End point Easting / Northing: 456183, 6420791		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
E. maculata	30		Breynia oblongifolia	0.1	10	Geitoplesium cymosum	0.1	10	Smilax glyciphylla	0.1	1
E. canaliculata	10	4	Acacia longifolia	0.1	3	Dianella caerulea var. producta	2i	15	Cupaniopsis anacardioides	0.4	3
			Pittosporum revolutum	0.1	3?	Opliismenus aemulus	0.2	50+	Sarcopetalum harveyanum	0.1	1
			Pittosporum undulatum	0.2	3	Ehrharta erecta	0.1	20	Pandorea pandorana	0.1	6
			Acacia elongata (long, 2 veins, linear)	0.1	2	Desmodium varians	0.3	50	Pteridium esculentum	0.1	5
			Gonocarpus* tetragynus	0.1	1	Lantana camara*	0.2	10	Psilotum nudum		
			Oplismenus aemulus*	0.1	2	Dichondra repens	0.1	50	Cynodon dactylon*	0.1	5
			Ficus microcarpa*	0.1	1	Asparagus aethiopicus*	0.1	20	Grass 1	0.2	50
			Hibbertia dentata	0.1	1	Senna pendula*	0.1	4	Grass 2	0.1	20
			soft-toothed Myrsine sp.	0.1	1	Commelina cyanea	0.1	15	Grass 3	0.1	20
			Myrtaceae	0.1	1	Microlaena stipoides	0.1	20	Veronica plebeia	0.1	1
			Sarcopetalum Hetrophylla	0.1	1	Chrysanthemoides monilifera* subsp. rotundifolia	0.2	25	Glycine tabacina	0.1	10
			Polyscias elegans	0.1	1	Entolasia marginata	0.2	50	Oplismenus hirtellus	0.1	7
Backhousia sphaerocarpa	0.1	1	Lycopodiella sp.	0.1	1	Lomandra longifolia	0.1	6	Dichelachne micrantha	0.1	5
Parsonsia straminea	0.1	2	Einstrophus latifolius	0.1	5	Melicope micrococca	0.1	2	Oxalis perennans	0.1	5
Smilax australis	0.1	1	Echinopogon caespitosus	0.1	2	Notalaea longifolia	0.1	3	Solanum nigrum*	0.1	1
Stephania japonica	0.1	1	Stegostachya australis	0.1	10	Hardenbergia violacea	0.1	1	Kennedia rubicunda	0.1	5
Total Cover DO FIRST			Glycine clandestina	0.1	1	Cheilanthes sieberi	0.1	3			

20mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Opliismenus hirtellus 20/0.1

Lomandra procera 0.1 10 Bidens pilosa* 0.1

Conyza sp.* 0.1 1 Notalaea sp. 0.1 1

Ageratum* ? 0.1 2

Senecio* 0.1 1
madagascariensis

Mel. sp - near plot micrococcus outside plot

1262

Tallow wood – small-fruited Grey Gum

fire-regrowth

Brunoniella 0.1 4

Lomandra multiflora 0.15

Digitaria 0.1 20

83 2TR Diamet 41.5

Date: 30/11/21	Job number: 2506	Site: Blueys	Plot ID: P01	Bearing: 150	Observers: FOB DK
Starting point Easting / Northing: 0456161 6420832			End point Easting / Northing:		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: **Departure time:** **Weather:** cloudy, humid

TWO Transect photos (one landscape one Portrait) taken ✓

1000m² plot **Mapped Vegetation community:**

Transect GPS points taken ✓

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm
< 5 cm	P / A
5 - 9 cm	P / A
10 – 19 cm	P / A
20 – 29 cm	P / A
30 – 49cm	P / A
50 -79cm	# 6
>80cm	#

Count of Hollow Bearing Trees

Total 1 (stag)

Length of logs (m)
Note: >10cm diameter, >50cm length

—

Total metres

Leaf Litter Cover within 5 x 1m² sub-plots
Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect
Litter includes leaves, seeds, twigs and branches less than 10cm in diameter.
Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	75	otherwise
2	85	litter
3	30	
4	45	hoje
5	5	
Average	48	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Evidence of historical clearing, small to moderate weediness

Habitat features, comments and incidental fauna observations:

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.
Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculotor may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Quadrat not at transect start

Date: 30/11/21	Job number: 2606	Site: Blueys	Plot ID: P02	Bearing: 167	Observers:
Starting point Easting / Northing: T 0456261 6420799 Q 456263, 6420789			End point Easting / Northing: T 456269 6420757 Q 456265, 6420771		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
Cor. pauciflora (Corymbia calophylla)	15		Breynia oblongifolia	0.1	8	Lomandra longifolia	0.1	20	Summer Dianella grass *	0.1	8
Euc. pauciflora	15		Acacia longifolia	0.1	5	Dianella caerulea	0.1	25	Viola * banksii	0.1	40
Casuarina glauca	8		Eriostemon Blue Bush *	0.1	20	Smilax (Sarsa) glyciphylla	0.1	4	Hydrocotyle Lobelia purpurascens	0.1	20
Melaleuca ericifolia	11		Glochidion ferdinandi var Cheese tree ferdinandi	0.1	12	Ficus sp Basket Dichelachne crinita	0.2	100	Snake vine Stephania japonica	0.1	5
E. haemastoma	10		Livistona australis Cabbage tree palm	0.1	2	Hemarthria Trianoptiles	0.1	40	Conocarpus * laevigatus	0.1	3
			Gymnoschoenus sphaerocephalus	0.1	5	Carex * appressa	0.1	20	Hydrocotyle (Table pear) rudiata	0.1	10
			Senna * pendula	0.1	3	Grass 1 *	0.2	50	~~Centrolepis pleiantha~~		
			Ficus sp *	0.1	5	Entolasia (Rich Tuft) marginata	0.1	40	Hibbertia scandens	0.1	2
			~~Bolboschoenus~~ Cyperus Cantoria rara	0.1	10	Microlaena stipoides	0.1	5	Pandorea pandorana	0.1	2
			~~Cissus hastata~~ polyscias sp	0.1	1	Oxalis Antrosh's	0.1	32	Billardiera * scandens	0.1	1
			Tuckeroo Cupaniopsis anacardioides	0.1	4	Asparagus aethiopicus	0.1	15	Gahnia Clarkei	0.1	4
			Banksia Integrifolia	0.1	1	Pteridium esculentum	0.1	100	Pearl Vine Sarcopetalum harveyanum	0.1	1
			Syzygium * Australe Oleosum	0.1	10	Hibbertia (Guinea flower) dentata	0.1	3	Mercurion	0.1	1
			Leucopogon? Heath	0.1	3	Gahnia Melanocarpa	0.1		Imperata cylindrica	0.2	100
			Ceitonoplasium ~~plasium~~ Cymosum	0.1	4	ochna serrulata	0.1	3	Grass 2 * Paspalum orbiculare	0.1	20
			Notelaea longifolia	0.1	8	Cenchrus (Gehrdtii) Echinopogon caespitosus	0.1	10	Melaleuca Melicope	0.1	4
			Pittosporum ~~rev~~ Rhag rev.	0.1	3	Kunzea Leptospermum ambigua * flavescens *	0.1	30	Rubus * parvifolius	0.1	10
Total Cover DO FIRST			~~Cissus~~								

20mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Mid
- Parsonsia 0.1 3
- Notelaea 0.1

1717 Broad-leaved Paperbark - swamp margins on L - saw sedge swamp of the CC + lower NC

Date: 30/6/21	Job number: 2506	Site: Blueys	Plot ID: POL	Bearing: 167	Observers: EOB OK
Starting point Easting / Northing: 0456261 6420799			End point Easting / Northing: 0456269 6420757		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: **Departure time:** **Weather:** cloudy, humid, cool **TWO** Transect photos (one landscape one Portrait) taken ✓

1000m² plot **Mapped Vegetation community:** **Transect GPS points taken** ✓

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	P / A	—
5 - 9 cm	(P) / A	Total
10 – 19 cm	(P) / A	
20 – 29 cm	(P) / A	Length of logs (m) **Note:** >10cm diameter, >50cm length
30 – 49cm	(P) / A	
50 -79cm	# —	2
>80cm	# —	Total metres

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	50	
2	95	
3	25	
4	95	
5	5	
Average	54	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Western half monocultural M. ericifolia

Habitat features, comments and incidental fauna observations:

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Date: 30/11/21	Job number: 2506	Site: Blues	Plot ID: P3	Bearing: 177	Observers: RobDK
Starting point Easting / Northing: 645194 / ~~6420653~~ 6420653			End point Easting / Northing: 645192/6420604		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
Melaleuca quin.	40		Chrysanthemoides monilifera	<0.1	30	Asparagus aethiopicus asparagoides	0.1	2	Geitonoplesium cymosum	<0.1	5
E. tereticornis	0.5	1	Bursaria obovata	0.1	7	Dianella revoluta	0.5	50	Gymnothales javanicoides	<0.1	+
Cas. glauca	0.1	1	Senna pendula	0.1	15	Centella asiatica	0.3	50	Oplismenus imbecillis	0.1	
			Glochidion ferdinandi	0.2	3	Sida rhombifolia	0.1	10	Plantago lanceolata	0.1	5
			Notelaea ovata	0.1	1	Hypochaeris radicata	0.1	10	Microlaena stipoides	0.1	20
			Lantana camara	0.2	10	Dianella caerulea var. producta	0.1	12	Setaria sp.	0.1	1
			Pittosporum revolutum	0.3	3	Lobelia purpurascens	0.1	50	Aristida	0.1	10
			Notelaea longifolia	0.2	4	Lysimachia arvensis	0.1	2	Oxalis	0.1	1
			~~Leucopogon~~ ? Astroloma humifusum	0.1	1	Poranthera microphylla	0.1	10	Sporobolus	0.1	1
			Cyanthopsis arenicolens	0.2	1	Pultenaea humilis	0.1	5	Glycine tabacina	0.1	20
			Gompholobium huegelii	0.1	5	Taraxacum officinale	0.1	1	Lomandra longifolia	0.1	5
Epilobium	0.1	1	Ligustrum undulatum	0.1	1	Oplismenus aemulus	0.2	50	Polymeria calycina	0.1	5
Viola hederacea	0.1	10	Rubus fruticosus agg.	0.1	1	Leptospermum sp.	0.1	15	Bulbine glauca	0.1	1
Lindsaea linearis	0.1	1	Eragrostis sp.	0.1	1	Digitaria sanguinalis	70		Cynodon dactylon	0.5	50+
Hydrocotyle bon	0.1	5	Callistemon salignus	0.5	1	Echinopogon caespitosus	0.1	10	Sisyrinchium rosulatum	0.1	1
Poa labillardieri	0.1	5	Acacia floribunda	0.1	1	Desmodium varians	0.1	20	Gonocarpus teucrioides	0.1	7
Rubus moluccanus	0.1	1				Entolasia marginata	0.2	50	Fimbristylis dichotoma	0.1	5
Total Cover DO FIRST			Rhoeo spathacea	0.1	5	Spike grass	0.1	10	rush	0.1	5
									Echinopogon ovatus	0.5	50
									Ranunculus	0.1	1

20mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Date: 30/8/11	Job number: 2506	Site: Bluegs	Plot ID: Po 3	Bearing: 177	Observers: D.K
Starting point Easting / Northing: 0456194 6420653			End point Easting / Northing: 456192 / 6420604		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: 3:15 **Departure time:** **Weather:** Overcast, light showers

TWO Transect photos (one landscape one Portrait) taken ✓

1000m² plot **Mapped Vegetation community:**

Transect GPS points taken ✓

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	P / A	0
5 - 9 cm	P / A	Total
10 – 19 cm	P / A	
20 – 29 cm	(P) / A	Length of logs (m) **Note:** >10cm diameter, >50cm length
30 – 49cm	(P) / A	0
50 -79cm	# 3	
>80cm	#	Total metres

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	20%	
2	10%	
3	10%	
4	5%	
5	10%	
Average	11	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Weedy grasses present, evidence of grazing or mowing

Habitat features, comments and incidental fauna observations:

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Date: 1/12/21	Job number: Blueys beach 2506	Site: LO4 Blueys Beach	Plot ID: PCT4	Bearing: 168	Observers: DK FOB
Starting point Easting / Northing: 455902 6420359			End point Easting / Northing: 455908 6420312		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
Lophostemon confertus	30		Wilkea hugeliana	0.5	20	Gahnia clarkei	0.5	50	Cissus hypoglauca	5	
Ficus	20		Lantana camara	10		Lomandra longifolia	0.1	5	Rubus moluccanus	0.1	10
Livistona australis	0.5		Pittosporum multiflorum	0.5	30	Smilax australis	1	20	Dianella caerulea var prod.	0.1	1
Archontophoenix cunninghamiana	25		Notelaea [illegible]	0.1	5	Clematis aristata	0.1	20	Pollia crispus	0.1	10
			Myrsine sp. #?	0.5	10	Pseuderanthemum variable	0.1	50	Asparagus aethiopicus	0.1	2
			Meliaceae	0.1	5	Entolasia marginata	0.2	100	Oplismenus aemulus	0.1	50
			Alphitonia excelsa	2	10	Pandorea pandorana	0.1	5	Passiflora caerulea	0.1	1
			Scoloposia brauna	0.5	30	Doodia aspera	1	100	Bidens pilosa	0.1	1
			[illegible]	0.1	5	Stephania japonica	0.1	20	Pipgonium album	0.2	30
			Senna pendula	0.1	20	Geitonoplesium cymosum	0.1	100	Gahnia melanocarpa	0.5	20
			Acacia elongata	0.1	1	Dioscorea transversa	0.2	30	Sida rhombifolia	0.1	1
			Steldus brunonianus	0.1	4	Oplismenus imbecillis	0.1	50	Oryza sp.	0.1	1
Whole leaf toothed conical	0.2	1	Commersonia fraseri	10		Hibbertia dentata	0.1	1	not Passiflora	0.1	10
	0.1	2	Ficus coronata	0.1	3	Leptospermum laevigatum	0.1	10	Sarcopetalum harveyanum	0.1	1
Glochidion ferdinandi	0.2	1	Pomaderris ferruginea	0.1	5	Agrostis? Gahnia? Alectryon subcinereus	0.1	1			
Syzygium	0.5	2	Syncarpia glomulifera	1	50	Azeratum corymbosum	0.2	20			
			unidentified seedling	0.1	1	Cissus antarctica	0.1	20			
Total Cover DO FIRST			Banksia integrifolia	0.1	2	Eustrephus latifolius	0.1	50			

20mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

PCT 1569
YTB Flooded Gum - Brush Box Tallowood mesic tall open forest on range of the lower

Date: Date:	Job number:	Site:	Plot ID: P04	Bearing: 165°S	Observers: P.L F.O
Starting point Easting / Northing: 0455902 / 6420359			End point Easting / Northing: 0455906 / 6420313		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: 10am **Departure time:** **Weather:** Overcast / light rain

TWO Transect photos (one landscape one Portrait) taken ✓

1000m² plot **Mapped Vegetation community:**

Transect GPS points taken ✓

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	(P) / A	0
5 - 9 cm	(P) / A	
10 – 19 cm	(P) / A	Total
20 – 29 cm	(P) / A	Length of logs (m) Note: >10cm diameter, >50cm length
30 – 49cm	(P) / A	
50 -79cm	#~~M~~ 3	0
>80cm	#	Total metres

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	75%	
2	90%	
3	80%	
4	85%	
5	60%	
Average	78%	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

Small patches of Lantana.

Habitat features, comments and incidental fauna observations:

Littoral rainforest, thick vegetation.

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator very dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Date: 1/12/21	Job number: 2506	Site: Blues	Plot ID: P05	Bearing: 305	Observers: DK/FO
Starting point Easting / Northing: 0456094/6420547			End point Easting / Northing: 0456054/6420576		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
Livistona australis	0.1	10	Ceratopetalum gummiferum	0.1	5	Lomandra long.	0.2	30	Lobelia purpuscens	0.1	25
Angophora costata	3	2	Syzygium sp.	0.2	20	Rumex unbellatus	0.3	50	Asparagus aethiopicus	0.1	10
Euc. pilularis	50	12	Acacia elongata	0.1	5	Dianella caerulea var. producta	0.1	20	Desmodium varians	0.1	15
Secamone elliptica	0.5	1	Pittosporum undulatum	0.1	6	Hibbertia dentata	0.1	5	Pteridium sp	0.1	20
			Balladeria scandens	0.1	12	~~Rapanea variabilis~~ (V) Rubus rubifolius	0.1	10	Austrodanthonia	0.1	5
			Senna pendula	0.1	5	~~Clematis aristata~~ Dioscorea transversa	0.1	10	Blechnum +	0.1	15
			Glochidion	0.1	8	~~*~~Trianoptiles esculentum	0.1	20	Oplismenus aemula	0.1	10
			Ozothamnus diosmifolius	0.1	5	~~Rapanea~~ Poa labillardieri Poaceae Asperata	0.2	30	Poranthera microphylla	0.1	2
			Polyscias sambucifolia	0.1	3	Kennedia rubicunda	0.1	20	Cissus antarctica	0.1	15
			Cupaniopsis anacardioides	0.1	5	Geitoplesium cymosum	0.1	15	Rubus	0.1	10
			Banksia integrifolia	0.1	3	~~Fern #2~~			Pandorea Pandorana	0.1	2
			Banksia oblongifolia	0.1	2	Acianthus weed from transects	0.1	10	~~Brachyloma ericoides~~		
			Pimelea linifolia +	0.1	+	Imperata cylindrica	0.1	3	Stephania japonica	0.1	+
			other not listed *	0.1	2	Viola banksii	0.1	25	Hibbertia scandens	0.1	5
			Pittosporum undulatum	0.1	3	Grass weed	0.1	15	Cissus antarctica	0.1	3
			Angophora costata	0.1	1	Smilax australis	0.1	25	Cissus (S-compound)	0.1	5
			Lantana camara	0.1	5	~~Polyscias sambucifolia~~			Entolasia stricta	0.1	10
Total Cover DO FIRST											

20mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

RCT 1021 Smooth-barked Apple open forest on coastal lowlands of

1556

*Trianoptiles esculentum

- Not Livistona australis
- Lomandra

~~Rapanea~~ Rubus

Date: 1/12/21	Job number: 2506	Site: Blueys	Plot ID: P05	Bearing: 305	Observers: RDBK
Starting point Easting / Northing: 0456094 6420547			End point Easting / Northing: 0456054 6420576		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: **Departure time:** **Weather:** clouds, light breeze, drizzle

TWO Transect photos (one landscape one Portrait) taken ✓

1000m² plot **Mapped Vegetation community:**

Transect GPS points taken ✓

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	(P) / A	2
5 - 9 cm	(P) / A	
10 – 19 cm	(P) / A	Total
20 – 29 cm	(P) / A	Length of logs (m) **Note:** >10cm diameter, >50cm length
30 – 49cm	(P) / A	
50 -79cm	# 11	
>80cm	#	Total metres

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter.

Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	5	
2	10	
3	40	
4	20	
5	20	
Average	19	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

previous burn – scorched blackbutts

Habitat features, comments and incidental fauna observations:

Dense leaf litter

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Rainbow Lorikeets

Date: 3/2	Job number: 2506	Site:	Plot ID: 6	Bearing: 180	Observers: Fois DK
Starting point Easting / Northing: 456295 6420683			End point Easting / Northing: 456286 6420642		

AEP
ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper Stratum	C	Ab	Lower Stratum	C	Ab	Lower Stratum	C	Ab
			Senecio madagas.	0.1	5	Hypochaeris radicata	0.1	5
			Cenchrus clandestinus	35		Gamolepis	0.1	50
			Dichelachne repens	0.3	50	Cyperus sphaerocephalus	0.2	20
			Cynodon dactylon	35		Juncus bufonius	0.5	100
			Viola sp.	0.1	10	Setaria sp.	5	
			Cyperus polystachyos	0.1	20	Verbena sp.	0.1	1
			Richardia humi.	0.1	50	Lysimachia arvensis	0.1	5
			Sida rhombifolia	0.1	10	Conyza sp.	0.1	5
			Oxalis perennans	0.1	5			
Total Cover DO FIRST								

0mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m
(%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.
bundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Date: 3/2	Job number: 2506	Site:	Plot ID: 6	Bearing:	Observers:
Starting point Easting / Northing:			End point Easting / Northing:		

AEP
ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: 9:52 **Departure time:** **Weather:** Raining

TWO Transect photos (one landscape one Portrait) taken ☑

1000m² plot **Mapped Vegetation community:** non-native

Transect GPS points taken ☑

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	(P) / A	
5 - 9 cm	(P) / A	—
10 – 19 cm	(P) / A	Total
20 – 29 cm	(P) / A	Length of logs (m)
30 – 49cm	(P) / A	**Note:** >10cm diameter, >50cm length
50 -79cm	#	—
>80cm	#	Total metres

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter.

Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1		
2		
3		
4		
5		
Average		

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

mown paddock

Habitat features, comments and incidental fauna observations:

previous stock grazing

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Date: 3/2/22	Job number: 2506	Site: Blueys Beach	Plot ID: 7	Bearing: 250	Observers: DK FOB
Starting point Easting / Northing: (switch)	456042, 6420245		End point Easting / Northing:	456083, 6420268	

AEP
ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Ground stratum	C	Ab
Livistona australis	0.5	1	Lantana camara	1	50	Doodia aspera	0.3	50			
Diploglottis australis	1	1	Smilax australis	0.2	50	Adiantum hisp. / Pellaea falcata	0.3	50			
Ficus fraseri ?	3	3	Cissus antarctica	3		Clematis ar.	0.1	20			
Ficus coronata	0.1	1	Cissus hypoglauca	0.5	20	Pteridium esculentum	0.1	5			
Glochidion	0.1	4	Acacia implexa	15		Oplismenus aemulus	0.1	50			
			Ripogonum album	0.2	5	Asparagus aethiopicus	0.1	1			
			Senna pendula	0.1	3	Capsosma repens	5				
			~~Rubus~~ sp.	2							
			~~Rubus~~ ~~streblus~~	0.1	1						
			P. hts. pen.	0.1	1						
			Gymnothadeg	0.1	5						
			Syzygium oleosum	5							
			Wilkea	0.1	1						
			Breynia	0.1	1						
			Cyanthopsis	0.1	1						
			Notelaea longifolia	0.2	2						
			P. Tho multi	0.1	2						
Total Cover DO FIRST			Hibbertia scandens	15							

0mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 2[illegible]% = 10x10m

(%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants

bundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Date: 3/2/22	Job number: 2506	Site: Blues Beach	Plot ID: 7	Bearing: 250	Observers: DC FOB
Starting point Easting / Northing:			End point Easting / Northing:		

AEP
ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: **Departure time:** **Weather:**

1000m² plot **Mapped Vegetation community:** Lit ref

TWO Transect photos (one landscape one Portrait) taken ☑

Transect GPS points taken ☑

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	P / (A)	—
5 - 9 cm	P / (A)	Total
10 – 19 cm	(P) / A	Length of logs (m)
20 – 29 cm	(P) / A	**Note:** >10cm diameter, >50cm length
30 – 49cm	(P) / A	—
50 -79cm	# —	
>80cm	# —	Total metres

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	80	
2	95	
3	100	
4	90	
5	95	
Average	92	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

remnant vege along drainage line surrounded by slashed grass

Habitat features, comments and incidental fauna observations:

pigeons Lantana, senna

dense canopy, little understorey

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Modified plot – 14 x 11 m

14 x 14 m

Date:	Job number:	Site:	Plot ID:	Bearing:	Observers:
9/2/22	2806		DAM1 (8)		SC FOB
Starting point Easting / Northing: 456259, 6420743; 456252, 6420757;			End point Easting / Northing: 456244, 6420751		

AEP
ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper Stratum	C	Ab	Mid Stratum	C	Ab	Lower Stratum	C	Ab	Epiphytes/Climbers	C	Ab
M. quinq.			M. quin. 2x2	3	5	Nymphaea caerulea blue water 5x5	15				
			Casuarina glauca 3x2	4	12	Schoenoplectus mucronatus	0.5	10			
						Juncus usitatus 1x1	0.6	20			
						Eleocharis sphacelata 5x10	30				
						Paspalum wanderocanum 3x3	4	50			
						Portulaca oleracea (incipient weed)	0.1	1			
						Goodenia stelligera	0.1	20			
						Juncus planifolius	0.1	10			
						Cynodon dactylon	0.1	50+			
						Centella asiatica	0.1	5			
						Fimbristylis dichotoma	0.1	2			
Total Cover DO FIRST											

0mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

(%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

bundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Date:	Job number: 7506	Site: BLUEYS	Plot ID: DAM (B8)	Bearing:	Observers: FOB 2SK
Starting point Easting / Northing: 0456260/6420743 B81	0456253/6420857 B82		End point Easting / Northing: 0456245/6420751 B83		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: 11:45 **Departure time:** **Weather:** SUNNY, PARTLY CLOUDY, HUMID, 23-5 **TWO** Transect photos (one landscape one Portrait) taken ✓

1000m² plot **Mapped Vegetation community:** DAM **Transect GPS points taken** ✓

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	(P) / A	
5 - 9 cm	(P) / A	
10 – 19 cm	(P) / A	Total (0)
20 – 29 cm	P / (A)	Length of logs (m) Note: >10cm diameter, >50cm length
30 – 49cm	P / (A)	
50 -79cm	# (0)	
>80cm	# (0)	Total metres (0)

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	0	
2	0	
3	0	
4	0	
5	0	
Average	0	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

SLASHED AROUND EDGES, MAN MADE? DAM WALL, MOD WEEDINGS (WATER LILY).

Habitat features, comments and incidental fauna observations:

DRAGONFLY, BUTTERFLY, NOISY MINER, COMMON SP (SCALY? LITTLE?)

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Modified plot → bent plot 10 x 55 (10 x 40) flagged

Date: 8/2/22	Job number: 2806	Site:	Plot ID: 9 (Geeh)	Bearing: 141	Observers: SK FOR
Starting point Easting / Northing: 456088, 6420466; 456099, 6420443; 456090: 6420416			End point Easting / Northing:		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upperstratum	C	Ab	Midstratum	C	Ab	Lowerstratum	C	Ab	Lowerstratum	C	Ab
~~Brassica~~ Cirsium australis	0.5	3	Breynia oblongifolia	0.1	2	Typha orientalis	30		Carex appressa	0.1	10
			Acacia elongata	0.1	1	Ageratina adenophora*	10		Echinopogon micronatus	0.1	6
			Glochidion ferd.	0.1	1	Smilax australis	0.1	3	Chloris gayana*	0.1	20
			Lantana camera*	0.2	5	Plantago lanceolata	0.1	5	Ranunculus inundatus	0.1	20
			Senna pendula*	0-2	5	Oryza sativa*	0.1	4	Hydrocotyle bonariensis	0.1	50
			Solanum mauritianum*	0.1	1	Oxalis perennans	0.1	20	Rumex crispus	0.1	3
			Gomphocarpus fruticosus*	0.1	2	Senecio madagascariensis	0.1	20	Billy Goat Ageratum*	0.1	1
						Bidens pilosa*	0.1	20			
						Commelina cyanea	0.1	20			
						Rubus fruticosus	0.1	2			
						Echinopogon caespitosus	0.5	20			
						Paspalum mandiocanum	0.5	100			
						Cyperus eragrostis	0.1	1			
						Setaria sphacelata	0.2	30			
						Persicaria subsessilis	30				
						Verbena officinalis*	0.2	50			
						Sida rhombifolia*	0.1	20			
Total Cover DO FIRST						Hydrocotyle bonariensis*	0.1	10			

10mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

(%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

bundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Plot 55m x 10m

CREEKLINE

Date:	Job number: 2506	Site: BWCMS	Plot ID: B9	Bearing: 141	Observers: FOB, SK
Starting point Easting / Northing: 0456088/6420466 B91 / 0456100/6420443 B92			End point Easting / Northing: 0456091/6420416 B93		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: 1400 **Departure time:** **Weather:** Sunny, Partly Cloudy

TWO Transect photos (one landscape one Portrait) taken ✓

1000m² plot **Mapped Vegetation community:** CREEKLINE

Transect GPS points taken ✓

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	P / (A)	
5 - 9 cm	P / (A)	
10 – 19 cm	P / (A)	Total (0)
20 – 29 cm	(P) / A	Length of logs (m) **Note:** >10cm diameter, >50cm length
30 – 49cm	(P) / A	
50 -79cm	#	
>80cm	#	Total metres (0)

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter. Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1	0	
2	0	
3	0	
4	0	
5	0	
Average	0	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

SLASHED TO EDGE, HIGH WEEDINESS

Habitat features, comments and incidental fauna observations:

BUTTERFLY

Note: Tree Stem Size Class <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Modified plot — 14x14

Date: 8/2/22	Job number: 2806	Site: Blueys Beach	Plot ID: 10 Dam3	Bearing: 220	Observers: SK FOR
Starting point Easting / Northing: 456049, 6420449; 456039, 6420460; 456031, 6420448			End point Easting / Northing:		

AEP ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Upper stratum	C	Ab	Mid stratum	C	Ab	Lower stratum	C	Ab	Lower stratum	C	Ab
			Mel quin.	0.1	1	Typha orientalis	90		Schoenoplectus mucronatus	0.1	5
			Gompholobium latifolium	0.1	1	Rorippa laxa subsessilis	5		P. Alternanthera denticulata	0.1	10
			Glochidion ferd	0.1	1	Paspalum mandiocanum *	0.2	50	Juncus usitatus	0.1	20
						Lantana camara *	0.1	10	Eleocharis sphac.	0.3	50
						Persicaria decipiens	0.2	20	~~Fern~~ Hypolepis muelleri Christella dentata	0.1	1
						Rumex crispus	0.1	5	~~Fern~~ Histiopteris incisa	0.1	1
						Hydrocotyle bon *	0.1	5			
						Adiantum ad. *	0.2	10			
						Phildrymum lanuginosum	2	20			
						Plantago lanceolata *	0.1	5			
						Cotula coronopifolia	0.1	5			
						Centella asiatica	0.1	50+			
						senecio hyl. *	0.1	10			
						Gahnia aspera	0.1	2			
						Asplenium latifolium	0.1	1			
						Verbena brasiliensis *	0.1	5			
						Sida rhombifolia *	0.1	1			
Total Cover DO FIRST											

20mx20m plot = 400m² **Note:** 0.1% = 63x63cm, 0.5% = 1.4x1.4m, 1% = 2x2m, 5% = 4x5m, 25% = 10x10m

C (%): 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ... (to nearest 5%). Include overhanging plants.

Abundance: 1-20, 50, 100, 500, 1000 etc. (numbers >20 are estimates only. For overhanging plants, record abundance as 1.

Date: 8/2/22	Job number: 2801	Site:	Plot ID: 10	Bearing: 220	Observers: SK FOS
Starting point Easting / Northing:			End point Easting / Northing:		

AEP
ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Arrival time: **Departure time:** **Weather:**

TWO Transect photos (one landscape one Portrait) taken ☑

1000m² plot **Mapped Vegetation community:**

Transect GPS points taken ☑

Tree Stem Size Class DBH (1.3m high)	Presence/Absence Count above 50 cm	Count of Hollow Bearing Trees
< 5 cm	P / (A)	0
5 - 9 cm	(P) / (A)	Total
10 – 19 cm	(P) / A	Length of logs (m)
20 – 29 cm	P / (A)	**Note:** >10cm diameter, >50cm length
30 – 49cm	P / (A)	
50 -79cm	#	
>80cm	#	Total metres

Leaf Litter Cover within 5 x 1m² sub-plots

Note: - located at 5m, 15m, 25m, 35m and 45m along the transect - first plot located 5m on the left of the transect

Litter includes leaves, seeds, twigs and branches less than 10cm in diameter.

Also include dead material attached to living plants that is touching the ground.

	Leaf litter	Live vegetation, bare ground, rocks, etc.
1		
2		
3		
4		
5		
Average	0	

Plot Disturbance: (weediness, clearing, erosion, edge effects, grazing, fire, other)

raised dam wall, manufactured

Habitat features, comments and incidental fauna observations:

Note: Tree Stem Size Closs <5cm refers to any regenerating stems and does not require a height of 1.3m.

Note: Large Trees on the BAM Calculator vary dependant on PCT. We record number of all trees over 50cm, BAM Calculator may have large trees only over 80cm and 50 -79cm as Present or Absent this is PCT dependant.

Appendix G – Biodiversity Credit Report

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id

00030047/BAAS20013/21/00030048

Proposal Name

BAM data last updated *

16/06/2022

Assessor Name

Frances O'Brien

Assessor Number

BAAS20013

BAM Data version *

54

Proponent Name(s)

Report Created

31/08/2022

BAM Case Status

Open

Assessment Revision

0

Assessment Type

Part 4 Developments (General)

Date Finalised

To be finalised

BOS entry trigger

BOS Threshold: Biodiversity Values Map and area clearing threshold

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

Potential Serious and Irreversible Impacts

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

Species
Rhodamnia rubescens / Scrub Turpentine

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1556-Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	2	0	2.00
1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	Not a TEC	0.6	8	0	8.00
1737-Typha rushland	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	2	2.00
1537-Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.1	0	4	4.00
1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	1.6	0	34	34.00

1525-Sandpaper Fig - Whalebone Tree warm temperate rainforest	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions	0.0	0	1	1.00

1235-Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1235_Poor	No	29	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1235_dam	No	1	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 837, 839, 926, 971, 1064, 1092, 1227, 1230, 1231, 1232, 1235, 1649, 1715, 1716, 1717, 1718, 1719, 1721, 1722, 1723, 1724, 1725, 1730, 1795, 1798	-	1235_Melaleuca-dominant	No	4	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Forested Wetlands	Tier 3 or higher threat status	1235_Poor	No	29	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Forested Wetlands	Tier 3 or higher threat status	1235_dam	No	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Forested Wetlands	Tier 3 or higher threat status	1235_Melaleuca-dominant	No	4	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1262-Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Northern Hinterland Wet Sclerophyll Forests This includes PCT's: 690, 697, 698, 755, 1092, 1262, 1267, 1268, 1281, 1385, 1548, 1549, 1550, 1556, 1557, 1558, 1564, 1565, 1580, 1582, 1584, 1585, 1845, 1846, 1847, 1914	Northern Hinterland Wet Sclerophyll Forests <50%	1262_Poor	Yes	8	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region

	Wet Sclerophyll Forests (Grassy sub-formation)	Tier 4 or higher threat status	1262_Poor	Yes (including artificial)	8	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1525-Sandpaper Fig - Whalebone Tree warm temperate rainforest	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions This includes PCT's: 669, 670, 770, 845, 886, 887, 1068, 1201, 1275, 1302, 1525, 1527, 1528, 1529, 1533, 1534, 1535, 1541, 1545	-	1525_Poor	No	1	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Rainforests	Tier 3 or higher threat status	1525_Poor	No	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1537-Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Littoral Rainforest in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 670, 751, 910, 1275, 1534, 1536, 1537, 1832, 1833	-	1537_Moderate	No	4	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Rainforests	Tier 3 or higher threat status	1537_Moderate	No	4	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1556-Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 686, 828, 835, 941, 1108, 1109, 1212, 1228, 1293, 1318, 1326, 1386, 1504, 1556, 1594, 1618, 1720, 1794	-	1556_Poor	Yes	2	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

1556-Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast	**Variation options**					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Wet Sclerophyll Forests (Grassy sub-formation)	Tier 3 or higher threat status	1556_Poor	Yes (including artificial)	2	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1737-Typha rushland	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 780, 781, 782, 828, 1071, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1911	-	1737_Moderate	No	2	Karuah Manning,Hunter, Macleay Hastings, Mummel Escarpment and Upper Hunter. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Freshwater Wetlands	Tier 3 or higher threat status	1737_Moderate	No	2	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

BAM Biodiversity Credit Report (Variations)

Species	Vegetation Zone/s	Area / Count	Credits
Rhodamnia rubescens / Scrub Turpentine	**1235_Poor**	1.0	3.00

Credit Retirement Options

Like-for-like options

	Spp	IBRA region
Rhodamnia rubescens/ Scrub Turpentine	**Rhodamnia rubescens**/Scrub Turpentine *Note: Variation rules do not apply for Critically Endangered species and impacts on Commonwealth listed entities that are a controlled action.*	Any in NSW

Appendix H – Site Photographs

PCT 1525 - Sandpaper Fig - Whalebone Tree warm temperate rainforest south of the Subject Site

Below: Diamond python (*Morelia spilota spilota*)

Above: Exotic grassland along the Subject Site boundary

Below: *Littoria* spp.

Above: Managed understorey in Subject Site

Below: *Rhodamnia rubescens with A. psidii* in north of Subject Site

Above and below: better-quality remnant native vegetation in upslope retained lands

Above and below: Exotic grassland in south of Subject Site

Above and below: The centre of Subject Site is a mosaic of managed exotic grassland with scattered native shrubs and trees

Above and below: The centre of Subject Site is a mosaic of managed exotic grassland with scattered native shrubs and trees

Appendix I – Anabat Analysis Report

AEP
ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Bat Call Summary Report

Lot 23 Boomerang Drive, Blueys Beach, NSW

DRAFT

9 August 2022

AEP Ref: 2506

P 0418 681 581 E CRAIG@ANDERSONEP.COM.AU PO BOX210 ADAMSTOWN NSW 2289 ABN 27 170 660 510

1.0 Method

Analysis of bat echolocation calls was undertaken using Anabat Insight software. Identification was carried out utilising Pennay et al. (2004) along with comparison from recorded reference calls associated with the Sydney Basin. Calls we analysed by AEP Senior Ecologist, Chris Wark, who has 10 years of experience identifying microbats via ultrasonic recordings in both the United Kingdom and Australia.

Reference calls used were obtained from the NSW database and AEP confirmed bat call collection.

All calls were viewed, with unique calls tagged and identified. Calls that were too short (three pulses or less) were not analysed and tagged as unknown.

Certain microbat species have similar call frequencies, call shape and other characteristics which can make identification to species impossible using just call analysis. Where it was not possible to differentiate calls due to similar call characteristics the call was marked as species group.

Table 1: Confidence ratings of bat call sequences

Confidence	Description
Definite	Call has been identified to a particular species and could not be confused with another species.
Probable	Call has been identified to a particular species, with a low chance that it could be confused with another species.
Possible	Call has been identified to a particular species, but there is a moderate chance of confusion with another species.
Species group	Call could not be identified as a particular species due to call characteristics (poor quality/short sequence, bat species with overlapping frequencies, etc).
Unknown	Call sequences that are too short or of very poor quality.

2.0 Differentiation of species with similar calls

Separation of species with similar calls is possible using particular call characteristics, a short description of characteristics used to distinguish species is included in **Table 2**. Note that it is not always possible to separate similar calls and is affected by the length and quality of recorded calls.

Species names are based on the Australian Chiroptera taxonomic list (Reardon et al. 2015) with changes made to keep the naming conventions in line with DPIE.

Table 2: Call characteristics used to differentiate species

Species	Characteristic
Miniopterus australis/ Vespadelus pumilus	Differences in frequency or presence of a down-sweeping tail indicating *M.australis*.
Chalinolobus morio/ Vespadelus sp.	Presence of a down-sweeping tail on majority of calls indicated *C.morio.*
Vespadelus troughtoni / Vespadelus vulturnus / Vespadelus pumilus	It is not currently possible to differentiate between *V.vulturnus* and *V.troughtoni* on call characteristics alone. *V.pumilus* can be differentiated only when call frequency is above 54khz.
Ozimops ridei / Micronomus norfolkensis	Call frequency and alternation of pulses within the call indicates *M.norfolkensis*.
Ozimops ridei / Ozimops planiceps	Differentiated using characteristic frequency.
Chalinolobus gouldii	Differentiated from other species by frequency and presence of curved alternating calls.
Myotis macropus/ Nyctophilus spp.	*M.macropus* differentiated based on calls with initial slope >400 OPS and pulse intervals <75ms. Secondary characters used include central kink and slope variances between pulses. Requires high quality calls and is not always reliable.
Scotorepens orion / Scoteanax rueppellii	Calls from these species are very similar. Differentiation is based on the characteristic frequency and the frequency of the knee when compared to the characteristic frequency.
Falsistrellus tasmaniensis	Can be differentiated within good call sequences from *Scotorepens orion* / *Scoteanax rueppellii* based on length of pre-characteristic.

It should be noted that the number of call sequences for specific species does not allow for a quantitative understanding of the numbers present on site. Instead it should be taken as an idea of activity within the site for that particular species. It is not possible to compare activity levels between species due to differences in species detectability, foraging strategies and call characteristics.

3.0 Results

641 call sequences were recorded of which 479 were analysable (not short calls or noise files). Species that were identified definitively include (**threatened species in bold**):

- *Chalinolobus gouldii* (Gould's Wattled Bat)
- *Chalinolobus morio* (Chocolate Wattled Bat)
- ***Falsistrellus tasmaniensis*** **(Eastern Falsistrelle)**
- ***Micronomus norfolkensis*** **(Eastern coastal Free-tailed Bat)**
- ***Miniopterus australis*** **(Little Bent-winged Bat)**
- *Ozimops ridei* (Ride's Free-tailed Bat)
- ***Scoteanax rueppellii*** **(Greater Broad-nosed Bat)**
- *Vespadelus pumilus* (Eastern Forest Bat)

Bats that are likely to be on site but could not be definitively identified (i.e. those that were classified as possible or within a species group) include:

- ***Myotis macropus*** **(Large-footed Myotis)**
- *Nyctophilus geoffroyi* (Lesser Long-eared Bat)
- *Nyctophilus gouldi* (Gould's Long-eared Bat)
- *Scotorepens orion* (Eastern Broad-nosed Bat)
- ***Vespadelus troughtoni*** **(Eastern Cave Bat)**
- *Vespadelus vulturnus* (Little Forest Bat)

While all care has been taken it should be noted that certain bat species are difficult to identify by bat call and others may not have been recorded by the detectors. It is therefore recommended that a habitat assessment should be used in conjunction with this analysis to determine the likely occurrence of other bat species.

4.0 Sample Time vs Frequency graphs

A sample call for each unique bat species, that was identified (definitive/probable), is included below.

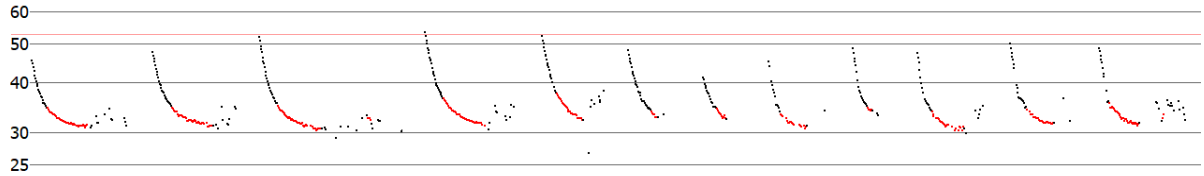


Figure 1 – *Chalinolobus gouldii* definite call

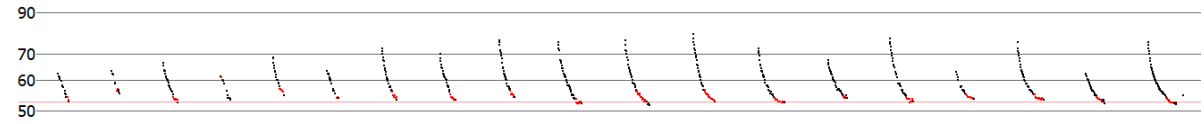


Figure 2 – *Chalinolobus morio* definite call

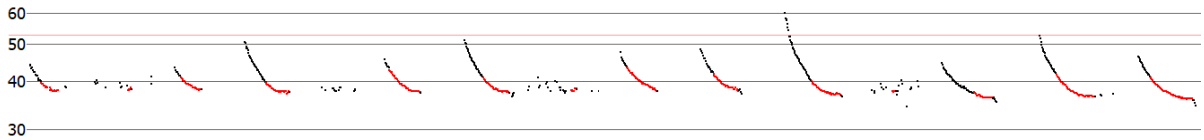


Figure 3 – *Falsistrellus tasmaniensis* probable call

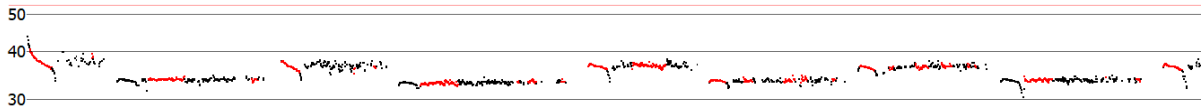


Figure 4 – *Micronomus norfolkensis* definite call

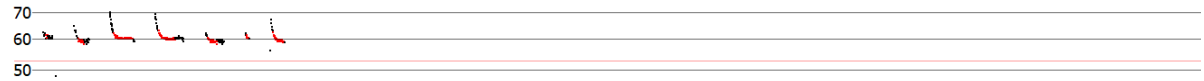


Figure 5 – *Miniopterus australis* definite call

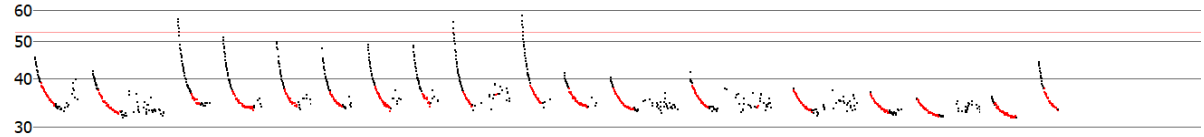


Figure 6 – *Scoteanax rueppellii* definite call

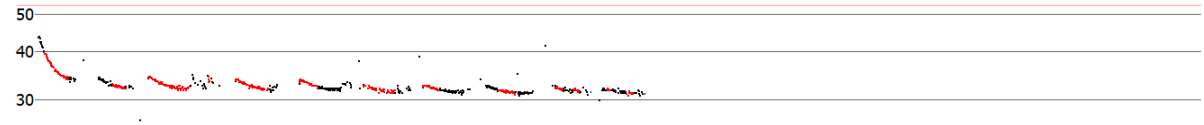


Figure 7 – *Ozimops ridei probable* call

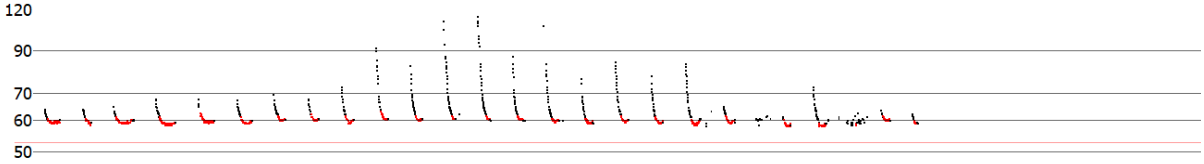


Figure 8 – *Vespadelus pumilus definite* call

Appendix J – Other Legislation

EPBC Act Assessment

A search was conducted in August 2019 of Matters of National Environmental Significance (MNES) as relevant to the *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act). The following MNES are considered in this assessment.

World Heritage Properties:

The site is not a World Heritage area, and is not in close proximity to any such area.

National Heritage Places:

The site is not a National Heritage place, and it is not in close proximity to any such place.

Wetlands of International Significance (declared Ramsar wetlands):

The site is not part of, or within close proximity to, any wetlands of international significance.

Great Barrier Reef Marine Park:

The site is not part of, or within close proximity to, the Great Barrier Reef Marine Park.

Commonwealth Marine Areas:

The site is not part of, or within close proximity to, any Commonwealth Marine Area.

Threatened Ecological Communities:

A Protected Matters search lists the following TECs as potentially occurring within 10km of the Subject Site:

- *Coastal Swamp Oak (Casuarina glauca) Forest of NSW and SE Queensland*
- *Littoral Rainforest and Coastal Vine Thickets of Eastern Australia*
- *Lowland Rainforest of Subtropical Australia*
- *Subtropical and Temperate Coastal Saltmarsh*

None of the PCTs determined on site are equivalent to the above TECs. However, site assessment did identify the presence of PCT 1556 – Tallowwood – Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast, which is associated with the federally listed Endangered community *Coastal floodplain Eucalypt forest of eastern Australia* (also known as *River-flat Eucalypt forest on coastal floodplains of southern NSW and eastern Victoria.*

This EPBC-listed CEEC has the following characteristics (section 5.1.1 DAWE 2020):

- IBRA Bioregions: South East Corner, Sydney Basin
- Location: Within catchments of the eastern and southern watershed of the Great Dividing Range
- Elevation: Generally below 50m but can be up to 250m in floodplain pockets or nick point plateaux

- Landforms: Occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans

- Soil: Alluvial including silts, loams, gravels and cobbles. Does not occur on soils that are primarily marine sands, or aeolian sands.

- Vegetation structure: Generally tall open forest to woodland, but can be closed or low especially where there is localised disturbance

- Dominant species: Has a canopy dominated by one or a combination of the following species: *Angophora floribunda, A. subvelutina, Eucalyptus amplifolia, E. baueriana, E. benthamii, E. bosistoana, E. botryoides, E. botryoides x E. saligna, E. elata, E. grandis, E. longifolia, E. moluccana, E. ovata, E. saligna, E. tereticornis, E. viminalis*

The Subject Site is located within the NSW North Coast IBRA Bioregion. It is located on an alluvial landform (multiple drainage lines, Wallis Lake 1.7km northwest) below 40m ASL. Soil type on site is mapped as lithosols. Vegetation is open and low within the Subject Site.

Species observed within the PCT 1556 Poor zone do not match with diagnostic species listed within the *Conservation Advice for the River-flat Eucalypt forest on coastal floodplains of southern NSW and eastern Victoria.*

Given that the Subject Site is located outside of the specified IBRA Bioregions, that the soil type on site is lithosols and that the species on site do not match with diagnostic species for the CEEC, it is determined that PCT 1556 Poor is not commensurate with this CEEC.

Threatened Species:

No EPBC-listed threatened species have been recorded on site.

Migratory Species:

White-throated Needletail (*Hirundapus caudatus*) was observed travelling over the Subject Site. A number of other EPBC-listed migratory species have some potential to visit the site on an intermittent basis. However, it is not considered that the development of this land as proposed is likely to significantly impact the potential habitat of such species, or disrupt migratory patterns, particularly given the retention of higher quality vegetation to the west of the Subject Site.

EPBC Act Assessment Conclusion:

Given that the development only provides potential seasonal foraging habitat for relevant species, and no Grey-headed Flying-fox roost camp is present within the site, referral under the EPBC Act is likely to be unnecessary for this development.

SEPP (Biodiversity and Conservation) 2021 Assessment

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (hereafter the Biodiversity and Conservation SEPP) came into force on 1 March 2022, repealing several existing SEPPs including State Environmental Planning Policy (Koala Habitat Protection) 2020 and State Environmental Planning Policy (Koala Habitat Protection) 2021. This Policy aims to consolidate matters of biodiversity and conservation in NSW, including vegetation management, issues of drinking water catchments and koala habitat protection.

In relation to koalas, this SEPP contains the following assessment:

Where land is zoned other than RU1, RU2 and RU3, where there is no approved koala plan of management for the land, and where the site is at least 1ha in size, it must be determined whether there will be any impact upon koalas or koala habitat, and the degree of any such impact. Matters to be considered are:

- Presence of any Schedule 2 Koala Use Tree Species,
- Presence of core koala habitat,
- Presence of trees with a DBH more than 10cm, or
- Presence of only horticultural or agricultural plantations.

The following Schedule 2 Koala Use Tree Species are present on the Subject Site:

- *Eucalyptus canaliculata*
- *Eucalyptus microcorys*
- *Eucalyptus pilularis*
- *Eucalyptus propinqua*
- *Eucalyptus siderophloia*
- *Melalueca quinquenervia*

“Core koala habitat” is defined as the following:

(a) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas are recorded as being present at the time of assessment of the land as highly suitable koala habitat, or

(b) an area of land which has been assessed by a suitably qualified and experienced person as being highly suitable koala habitat and where koalas have been recorded as being present in the previous 18 years.

In January 2022, AEP undertook SAT Surveys (per Phillips and Callaghan 2011). In February 2022, AEP undertook two consecutive nights of nocturnal surveys with call playback on both nights (refer **Figure 7**). A Songmeter was deployed in January and retrieved during February surveys. The searches did not result in finding any koalas, scats or markings within the Subject Site.

Examination of the Atlas and a search of BioNet revealed that the nearest record to the Subject Site is 150m east of the site, dated 2005. The most recent record, from 2020, is located over 5km to the west of the Subject Site. There are no records within the Subject Site or wider Study Area.

The VISs for the PCTs on site show that the vegetation quality is poor to degraded. Vegetation is present mainly as scattered paddock trees amongst slashed grassland previous grazed by cattle, isolated remnants, or as the disturbed edge of more intact and better-quality vegetation outside the Subject Site in the Study Area. Site vegetation is not of a standard to constitute “highly suitable” koala habitat.

Therefore, the Subject Site does not constitute Core Koala Habitat and no further assessment is required according to the SEPP.

SEPP (Resilience and Hazards) 2021 Assessment

State Environmental Planning Policy (Resilience and Hazards) 2021 (hereafter the Resilience and Hazards SEPP) came into force on 1 March 2022, repealing several existing SEPPs including State Environmental Planning Policy (Coastal Management) 2018 and State Environmental Planning Policy 55 - Remediation of Land. This Policy aims to minimise risks and harm from environmental hazards.

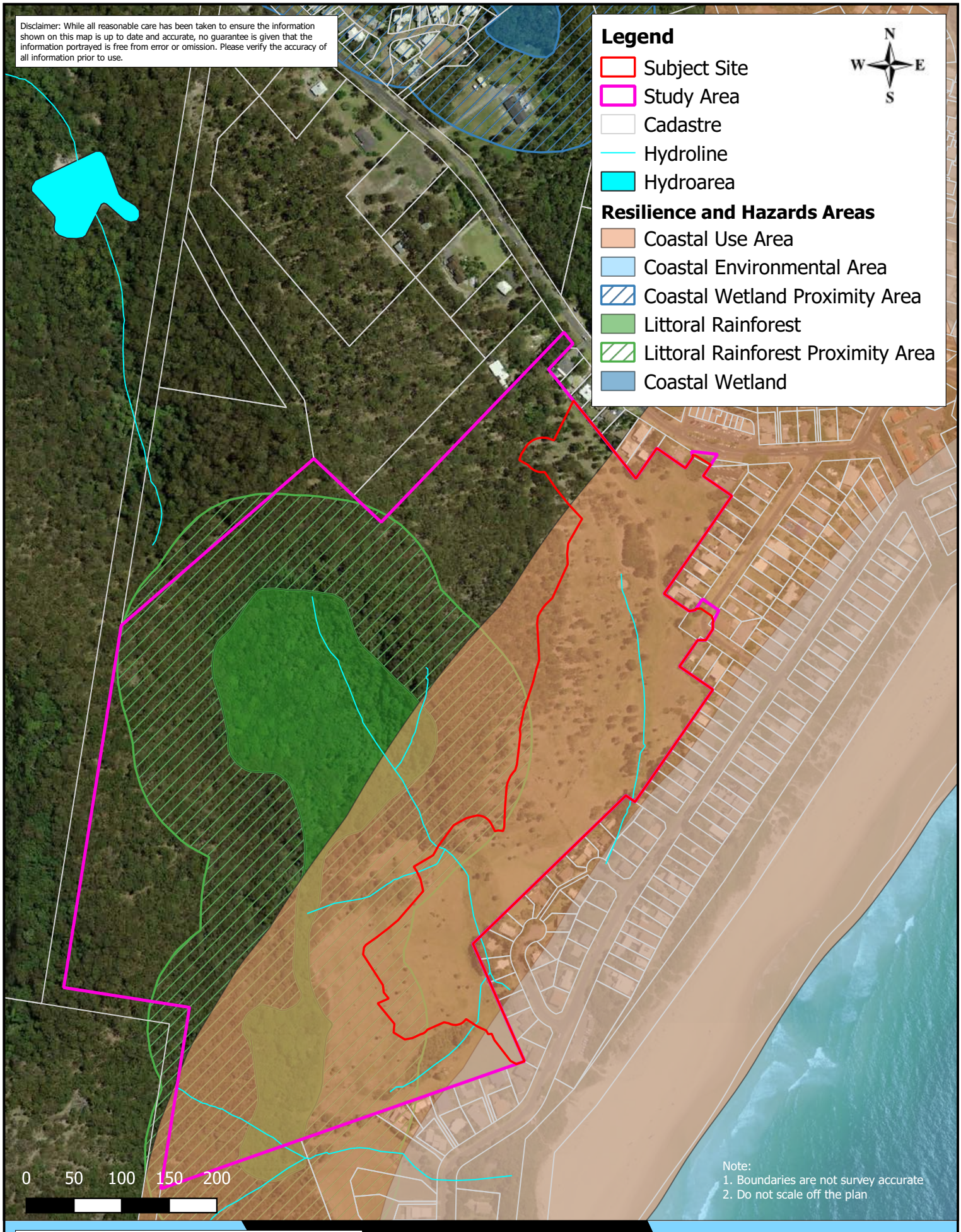
In relation to Coastal Management, this SEPP states that development consent must not be granted where land is identified as “proximity area for littoral rainforest” unless the proposed development will not significantly impact upon:

(a) the biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or

(b) the quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

Proximity Areas to Littoral Rainforest are mapped in the southwestern corner of the Subject Site (see **Figure 11** below**)**. The land within this mapped area contains some scattered native paddock trees but no significant vegetation remnants. The Subject Site is downslope of the mapped littoral rainforest.

Given the lack of native vegetation within the section of Proximity Area that falls within the Subject Site, and given that the Subject Site is downslope of the mapped littoral rainforest, thereby causing no impact upon the hydrological regimes of that vegetation community, it is highly unlikely that the proposed development will cause significant impact upon the mapped littoral rainforest.



AEP

Figure J1 - Resilience and Hazard Map

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 00030048

Client: Addenbrooke Pty Ltd

AEP ref: 2506.03

Water Management Act 2000

The Water Management Act 2000 is to provide for the sustainable and integrated management of the water sources of the State for the benefit of both past and future generations in particular-

- to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality,
- to recognise the role of the community, as a partner with government, in resolving issues relating to the management of water sources,
- to encourage best practice in the management of use of water.

Under the Water Management Act 2000, and approval is required to undertake controlled activities on waterfront land, unless that activity is exempt (section 91E) which this development is not.

Controlled activities include the carrying out of building work, such as erecting buildings and other structures, and the installation of infrastructure. They also include excavating or depositing material.

Waterfront land is the bed of any river, lake or estuary and any land within 40 metres of the highest bank of the river, the lake shore or the mean high-water mark of the estuary. This means that a controlled activity approval must be obtained from the NSW Office of Water before commencing the controlled activity.

Instream works recommended for this development will be regulated by the controlled activity provisions and include modifications enhancements to the watercourse, channel realignment, bed control structures, pipe laying and cable trenching.

Fisheries Management Act 1994

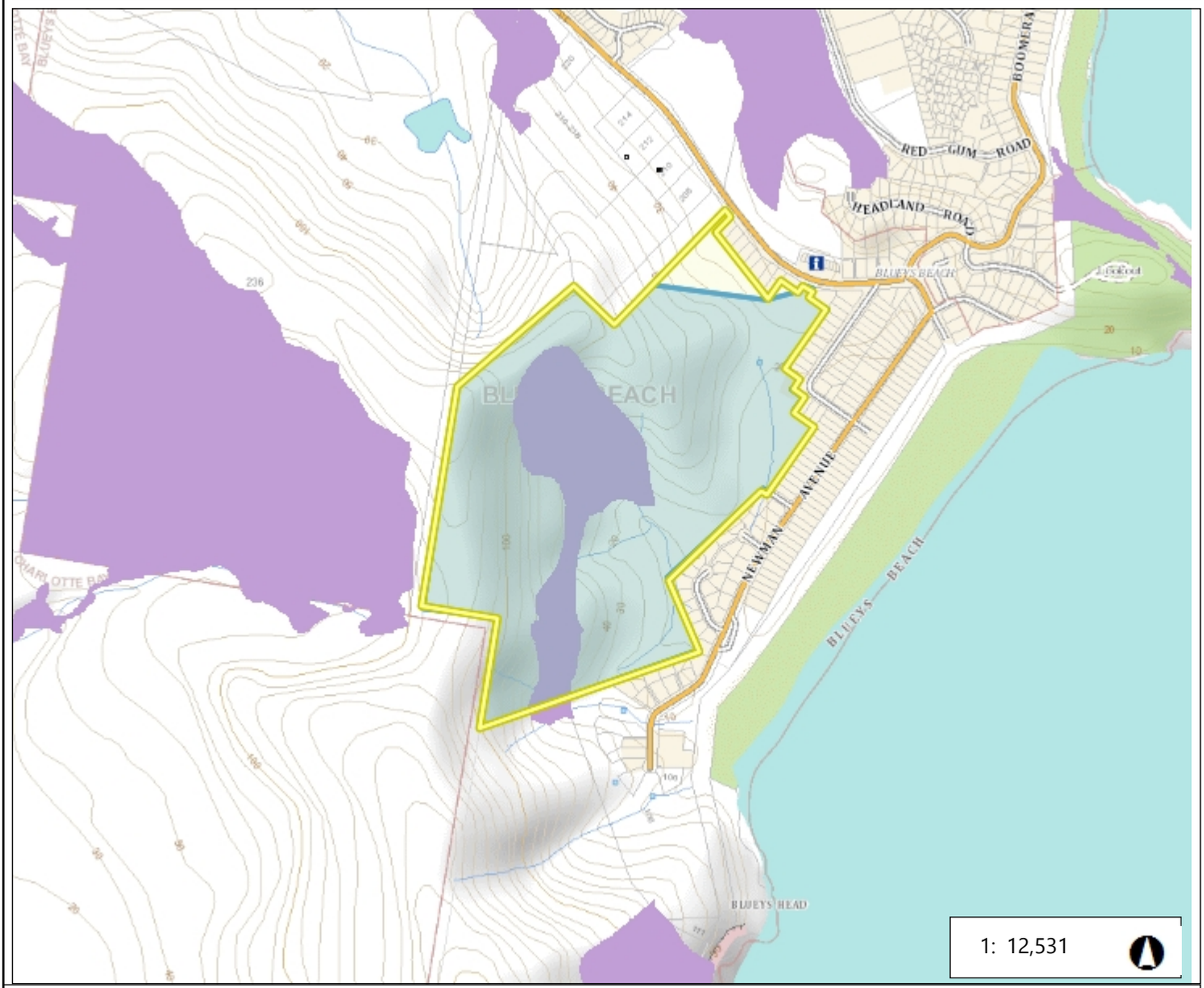
Waterways are impacted by this development and as such will require assessment under the *Fisheries Management Act 1994*. 1st and 2nd order streams are present on the proposed development site, which have been heavily modified and lead into a man-made channel curving around neighbouring properties and depositing at Blueys Beach via a presumed channel under the road. Sediment plumes are visible on the sand as result of the waterway exiting.

Section 201 of the Fisheries Management Act 1994 states “a person may not carry out dredging work or reclamation work except under the authority of a permit issued by the Minister”. Therefore, it is likely further assessment will be required following a detailed engineers design, requiring an application for a Permit in accordance with Section 201 of the *Fisheries Management Act 1994*.

There is no Key Fish Habitat (KFH) mapped on site.

Appendix K – BOSET Report

Biodiversity Offset Scheme (BOS) Entry Threshold Map



636.6 0 318.28 636.6 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Legend

- Biodiversity Values that have been mapped for more than 90 days
- Biodiversity Values added within last 90 days

Notes

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Biodiversity Values Map and Threshold Report

Results Summary

Date of Calculation	06/12/2021 3:04 PM		**BDAR Required***
Total Digitised Area	33.44	ha	
Minimum Lot Size Method	LEP		
Minimum Lot Size	0.04	ha	
Area Clearing Threshold	0.25	ha	
Area clearing trigger Area of native vegetation cleared	Unknown #		Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	yes		yes
Date of the 90 day Expiry	N/A		

*If BDAR required has:

- at least one 'Yes': you have exceeded the BOS threshold. You are now required to submit a Biodiversity Development Assessment Report with your development application. Go to https://customer.lmbc.nsw.gov.au/assessment/AccreditedAssessor to access a list of assessors who are accredited to apply the Biodiversity Assessment Method and write a Biodiversity Development Assessment Report
- 'No': you have not exceeded the BOS threshold. You may still require a permit from local council. Review the development control plan and consult with council. You may still be required to assess whether the development is '"likely to significantly affect threatened species' as determined under the test in s. 7.3 of the Biodiversity Conservation Act 2016. You may still be required to review the area where no vegetation mapping is available.

Where the area of impact occurs on land with no vegetation mapping available, the tool cannot determine the area of native vegetation cleared and if this exceeds the Area Threshold. You will need to work out the area of native vegetation cleared - refer to the BOSET user guide for how to do this.

On and after the 90 day expiry date a BDAR will be required.

Disclaimer

This results summary and map can be used as guidance material only. This results summary and map is not guaranteed to be free from error or omission. The State of NSW and Office of Environment and Heritage and its employees disclaim liability for any act done on the information in the results summary or map and any consequences of such acts or omissions. It remains the responsibility of the proponent to ensure that their development application complies will all aspects of the *Biodiversity Conservation Act 2016.*

The mapping provided in this tool has been done with the best available mapping and knowledge of species habitat requirements. This map is valid for a period of 30 days from the date of calculation (above).

Acknowledgement

I as the applicant for this development, submit that I have correctly depicted the area that will be impacted or likely to be impacted as a result of the proposed development.

Signature_____ Date:06/12/2021 03:04 PM

Appendix L – NSW Planning Portal Property Report

Property Report

BOOMERANG DRIVE BLUEYS BEACH 2428

Property Details

Address:	BOOMERANG DRIVE BLUEYS BEACH 2428
Lot/Section /Plan No:	23/-/DP537919
Council:	MID-COAST COUNCIL

Summary of planning controls

Planning controls held within the Planning Database are summarised below. The property may be affected by additional planning controls not outlined in this report. Please contact your council for more information.

Local Environmental Plans	Great Lakes Local Environmental Plan 2014 (pub. 4-4-2014)
Land Zoning	B1 - Neighbourhood Centre: (pub. 4-4-2014)
	C2 - Environmental Conservation: (pub. 5-11-2021)
	C4 - Environmental Living: (pub. 5-11-2021)
	R2 - Low Density Residential: (pub. 4-4-2014)
	RU2 - Rural Landscape: (pub. 16-10-2020)
Height Of Building	12 m
	8.5 m
Floor Space Ratio	0.4:1
	0.5:1
Minimum Lot Size	100000 m²
	400000 m²
	450 m²
	700 m²
Heritage	NA
Land Reservation Acquisition	NA
Foreshore Building Line	NA
Acid Sulfate Soils	Class 4
	Class 5
Local Provisions	Protection Corridor

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)

Detailed planning information

State Environmental Planning Policies which apply to this property

State Environmental Planning Policies can specify planning controls for certain areas and/or types of development. They can also identify the development assessment system that applies and the type of environmental assessment that is required.

- State Environmental Planning Policy (Building Sustainability Index: BASIX) 2004: Land Application (pub. 25-6-2004)
- State Environmental Planning Policy (Coastal Management) 2018: Land Application (pub. 17-12-2018)
- State Environmental Planning Policy (Coastal Management) 2018: Subject Land (pub. 23-3-2018)
- State Environmental Planning Policy (Concurrences and Consents) 2018: Land Application (pub. 21-12-2018)
- State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017: Land Application (pub. 1-9-2017)
- State Environmental Planning Policy (Exempt and Complying Development Codes) 2008: Land Application (pub. 12-12-2008)
- State Environmental Planning Policy (Housing) 2021: Land Application (pub. 26-11-2021)
- State Environmental Planning Policy (Infrastructure) 2007: Land Application (pub. 21-12-2007)
- State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007: Land Application (pub. 16-2-2007)
- State Environmental Planning Policy (Primary Production and Rural Development) 2019: Land Application (pub. 28-2-2019)
- State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017: Allowable Clearing Area (pub. 17-9-2021)
- State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017: Subject Land (pub. 25-8-2017)
- State Environmental Planning Policy No 33—Hazardous and Offensive Development: Land Application (pub. 13-3-1992)
- State Environmental Planning Policy No 50—Canal Estate Development: Land Application (pub. 10-11-1997)
- State Environmental Planning Policy No 55—Remediation of Land: Land Application (pub. 28-8-1998)
- State Environmental Planning Policy No 64—Advertising and Signage: Land Application (pub. 16-3-2001)
- State Environmental Planning Policy No 65—Design Quality of Residential Apartment Development: Land Application (pub. 26-7-2002)

This report provides general information only and does not replace a Section 10.7 Certificate (formerly Section 149)

Other matters affecting the property

Information held in the Planning Database about other matters affecting the property appears below. The property may also be affected by additional planning controls not outlined in this report. Please speak to your council for more information

Bushfire Prone Land	Vegetation Buffer
	Vegetation Category
Land near Electrical Infrastructure	This property may be located near electrical infrastructure and could be subject to requirements listed under ISEPP Clause 45. Please contact Essential Energy for more information.
Local Aboriginal Land Council	FORSTER
Regional Plan Boundary	Hunter

Appendix M – Vegetation Management Plan

Vegetation Management Plan

Boomerang Drive, Blueys Beach, NSW

Prepared For: Addenbrooke Pty Ltd

Prepared By: Anderson Environment and Planning

Date: 30 August 2022

AEP Reference: 2506.05

Revision: 01

VMP Lands: Drainage line in south of Subject Site

Current state of vegetation in drainage line.

View towards VMP Lands from the north, VMP land present at low point in landscape

Native vegetation on the edge of the Subject Site, north of the VMP Lands

P 0418 681 581 E CRAIG@ANDERSONEP.COM.AU PO BOX210 ADAMSTOWN NSW 2289 ABN 27 170 660 510

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Appendix A – Regeneration Species List
Appendix B – Authors' CVs

1.0 Introduction

Anderson Environment & Planning (AEP) was commissioned by W T Malouf Pty Ltd on behalf of Addenbrooke Pty Ltd (the Proponent) to prepare this Vegetation Management Plan (VMP) to detail and guide the rehabilitation of riparian associated with retained lands which is a part of a proposed multi-purpose development within Lot 23 DP 537919, off Boomerang Drive, Blueys Beach, NSW (the Site). The Site location is shown in Figure 1.

1.1 Site Details

Table 1 – Summary of Site Characteristics

Detail	Comments
Client	Addenbrooke Pty Ltd.
Title	Lot 23 DP 537919 (the Parent Lot).
LGA	Mid Coast Council (Council)
Local Environmental Plan	Great Lakes Local Environmental Plan 2014 (pub. 4-4-2014)
Study Area	Approx. 35.08ha.
Development Footprint	Approx. 8.88ha.
VMP Lands	Approx. 0.16ha.
Subject Site Zoning	B1 – Neighbourhood Centre, R2 – Low Density Residential, and C4 – Environmental Living
Subject Site Usage	Until recently the Site was used for livestock grazing. It is currently unoccupied, containing a mosaic of disturbed ecotones, comprising improved pasture, derived native grassland, two constructed dams within drainage lines and remnant native vegetation in varying condition.
Surrounding Usage	The Site is bounded by residential and commercial development to the north and east, cleared land and vegetation to the south and remnant naïve vegetation to the west.

1.2 Proposed Development

The following development of the Site is proposed, in accordance with the lad's zoning (the Development):

- Approx. 73 residential lots between 500-1000m^2;
- Approx. 2600m^2 of commercial space; and
- Associated roads and services.

1.3 VMP Lands Existing Plant Community Types

Examination of vegetation mapping Mid-north Coast Vegetation Mapping (Bell 2019) and previous assessments for the Site have informed initial vegetation classification.

Site surveys by AEP included multiple BAM Plot and random data point surveys to verify previously mapped vegetation communities, transect surveys for threatened flora as well as targeted survey for habitat and presence of threatened fauna.

Examination of Mid-north Coast Vegetation Mapping (Bell 2019) and previous assessments for the Site have informed vegetation classification:

- **PCT 1737 - Typha rushland** - This vegetation zone is located in the southern portion of the Subject Site. It follows a drainage line running from littoral rainforest in the west down to the eastern boundary of the site.

  The zone is narrow, consisting of the channel and banks of the drainage line, and surrounded on either side by slashed pastureland. The vegetation condition is likely owing to previous stock pressures and edge effects. A tenth plot (Plot 10) identified another patch of PCT 1737 in a dam outside the VMP Lands and to the west.

  Scattered *Livistona australis*, likely present due to the zone's location downstream of PCT 1537, are located along the drainage line. The dominant species are *Persicaria strigosa* and *Typha orientalis,* two diagnostic species of PCT 1737. There is also a significant proportion of non-native weed species that are also present through the site, such as *Senna pendula, Paspalum spp*. and *Lantana camara.*

- **Cleared / Non-native Grassland** - Subject Site has been identified as non-native vegetation and cleared land containing previously grazed paddocks and several dams. It is almost entirely devoid of native species and is dominated by non-native grasses such as *Cenchrus clandestinus* (Kikuyu), *Andropgon virginicus* (Whisky Grass) and *Setaria spp.* (Pigeon Grass) likely introduced in the scope of pasture improvement for cattle grazing. Other exotic species present include *Senecio madagascariensis* (Fireweed), *Hypochaeris radicata* (Catsear), *Trifolium repens* (White Clover), and *Lysimachia arvensis* (Scarlet Pimpernel).

  Cynodon dactylon (Couch) is co-dominant with Kikuyu. Although native, this species is considered non-endemic and potentially invasive in locations east of the Great Dividing Range in NSW.

1.4 VMP Objectives

The purpose of this plan is to define and outline actions to implement and monitor works for regeneration works within retained lands, refer to **Figure 3.**

The overall VMP objectives are to provide:

- Increase biodiversity within the VMP Lands;
- Reduce weeds loads;
- Regenerate and maintain native PCTs;
- Reduce indirect impacts on surrounding areas of vegetation;
- Protection of native fauna and the enhancement of foraging and habitat opportunities within VMP Lands;
- Include measures to mitigate impacts of construction activities upon naïve animal welfare; and
- Geomorphological stability of the unnamed streams to maintain biodiversity, function and water quality.

The five-year VMP aims to regenerate the vegetation to a state of Natural regeneration.

1.5 Project Team

Prior to commencement of construction, the Proponent will appoint a Project Ecologist to oversee and manage VMP measures scheduled in this VMP and a Bush Regeneration Contractor (BRC) to implement the plan.

BRCs must be accredited with the Australian Association of Bush Regenerators. The BRC Site Supervisor must:

- Have demonstrated minimum of 2 years' experience in bush regeneration or related field;
- Have experience at a supervisory level in providing training, supervision and technical advice to staff, clients and volunteers;
- Hold a current AQF 3 qualification or higher and must have completed the Bush Regeneration Level IV Certificate or have a diploma or degree in a field related to natural resource management; and
- Oversee all regeneration works prescribed in this VMP.

2.0 Regeneration Approaches

VMP schedules differing ecological approaches to the regeneration of the VMP Lands by implementing the principles of the Society for Ecological Restoration Australasia *National standards for the practice of ecological restoration in Australia* (SERA 2021, ed. 2.2). This approach utilises three integrated restoration techniques to achieve the end goal of Natural Regeneration. Approaches have been assigned to VMP Land areas based on their history of disturbance:

1. Reconstruction Approach – this approach is where a site is highly degraded and has limited to no ability to regenerate naturally.
2. Facilitated Regeneration Approach – this approach is when a site is in moderate condition, and will naturally regenerate with minimal plantings and weed management.
3. Natural Regeneration - this approach is where damage is relatively low, and pre-existing biota should be able to recover after cessation of degrading practices. It requires limited to no intervention, with weeding being the only task undertaken to encourage continual natural regeneration.

This approach is the overall aim for the entirety of the VMP lands to achieve this state within five (5) years.

This is based on general condition at the point of assessment, where the Ecologist determines the most appropriate level of regeneration based on the Biodiversity Assessment and random meander of the Subject Site.

The National Guidelines also require that at commencement of approved regeneration works the first step is to gather baseline data. It is undertaken at the commencement of the VMP to ensure the most appropriate measure are used to ensure regeneration can occur. Natural events such as drought high rainfall, fire, floods, etc can all have significant impact on the condition of vegetation within a site. Hence the guidelines require regeneration areas be broken into the three categories and detailed baseline data be collected at commencement.

2.1.1 Reconstruction Approach

This Approach is to be used where vegetation condition is poor, generally due to heavy anthropogenic influences such as clearing and grazing. Works includes:

- Site preparation – weed control, slashing and ripping of the soil;
- Mass planting of canopy and pioneering shrubs to quickly provide quick canopy to prevent re-infestation by exotic species; and
- Managing regrowth of exotic species while mass plantings establish.

Once these areas have the necessary cover to protect the lower layers within the vegetation community from the elements (such as direct sun, storms, winds, etc.), then direct seeding of grass, forbs, etc. will be conducted if required at the fourth year of management under this VMP. This will ensure the structure and composition of these communities will meet the targets set.

When set targets are met, works on these areas will then change to the Assisted Regeneration Approach.

2.1.2 Facilitated Approach

In lesser degraded areas, or once the areas under the Reconstruction Approach have achieved set targets for canopy and shrub cover and weed control, the Assisted Regeneration Approach will be used, where further active interventions to correct biotic or abiotic damage may be required as determined by Site monitoring (scheduled in Section 6).

Active interventions, which will be determined by the PE or Bush Regeneration Contractor (BRC) may involve the following works:

- Weeding,
- Watering;
- Replacement of dead plants; and
- Maintenance of tree guards, etc.

The aim of this approach is to manage vegetation to achieve set targets to move into the Natural Regeneration Approach.

2.1.3 Natural Regeneration Approach

This Approach is to be used where canopy, shrub and understorey layers are relatively intact and where exotic component is relatively low. Existing native biota is deemed to be able to recover naturally, with weeding and monitoring being the only tasks undertaken to ensure continued natural regeneration (works scheduled in Section 6).

3.0 Management Zones in Stage 1

The VMP lands be managed in two (2) Management Zones (MZs) to clearly identify of objectives and targets, **Figure 4** shows the MZs.

3.1.1 Zone 1: Reconstruction - Aquatic Zone

This zone is located in the low flow channel to toe of bank, consisting of a width of 1m – 2m; it will include the reinstating of aquatic vegetation and habitat such as snags.

The Reconstruction Approach is being utilised in MZ1 due to the high weed loads, erosion and lack of native vegetation within this zone. Therefore, planting of native species will assist with meeting the Targets outlines in **Section 6.**

Weeding as defined in **Table 2**, (effectively control priority species and areas through appropriate methods to eliminate highly competitive weeds from an area).

All works should be undertaken to ensure bed and bank stability, provisions of aquatic habitat for both flora and fauna (approx. 0.16ha).

As stated, the Reconstruction Approach requires active interventions, the tasks of which will be determined by the Bush Regeneration Contractor (BRC) and may involve the following tasks:

- Planting;
- Installation of snags;
- Weeding;
- Watering;
- Mulching (if required); and
- Replacement of dead plants (1:1).

The VMP aims to move into Natural Regeneration Approach by the end of Year 5.

3.1.2 Zone 2: Reconstruction – PCT 1537

MZ2 is located from the toe of bank to the edge of the VMP lands and will be replanted with PCT 1537 - *Tuckeroo - Yellow Tulipwood - Red-fruited Olive Plum Littoral Rainforest of the lower North Coast*. Vegetation is currently non-native grassland, so this PCT was chosen as scattered plants indicative of PCT 1537 vegetation are present to the west and east of the VMP area.

It is a requirement in the Great Lakes Development Control Plan (DCP) 2013, clause 16.14.3 for *Livistona australis* (Cabbage Tree Palms) removed for development to be relocated within the land. **Figure 3** shows the location of *Livistona* in and around the development area. As *Livistona* is a diagnostic species of PCT 1537, it is considered appropriate that some of the 32 trees mapped can be relocated within MZ2 as part of the regeneration works. The remainder will be utilised within landscaping as set out in the Landcape Management Plan.

The Reconstruction Approach is being utilised in this section due to the high weed loads and lack of native vegetation within this zone. Therefore, planting of native species form PCT 1537 will assist with meeting the Targets outlines in **Section 6.**

Weeding as defined in **Table 2** (effectively control priority species and areas through appropriate methods to eliminate highly competitive weeds from an area).

All works should be undertaken to ensure bed and bank stability, provisions of terrestrial habitat for both flora and fauna.

Signage is to be installed along the high bank providing information on the community and fauna species likely to use the banks and aquatic vegetation.

As stated, the Reconstruction Approach requires active interventions, the tasks of which will be determined by the Bush Regeneration Contractor (BRC) and may involve the following tasks:

- Planting;
- Installation of habitat;
- Weeding;
- Watering;
- Mulching (if required); and
- Replacement of dead plants (1:1).

The VMP aims to move into Natural Regeneration Approach by the end of Year 5.

4.0 Regeneration Targets

The Integrated Regeneration Approach will be used across the entire VMP Lands and the following targets have been designed to be measurable, providing both quantitative and qualitative data on species abundance and cover for the vegetation communities within the VMP Lands.

Weeds have a significant impact on structural integrity of vegetation communities. Flora surveys identified 44 exotic species, with the following list being the most prevalent within the vegetation communities on site;

Lantana (*Lantana camara*), Camphor Laurel (*Cinnamomum camphora*), Small-leaved privet (*Ligustrum sinense*), Blackberry (*Rubus fruticosis*)

Black Nightshade (*Solanum nigrum*), Cobbler's Peg (*Bidens pilosa*) and Asparagus Fern (*Asparagus aethiopithicus*).

Exotic grasses comprise *Paspalum dilatatum* and Narrow-leaf carpet grass (*Axonopus fissifolius*).

Some of these species are identified as priority weeds for Greater Sydney. Predominantly exotic grasses and other herbaceous weeds will be the focus of weed management activities.

To achieve a Natural Regeneration throughout the entire VMP lands within five (5) years targets have been set within **Table 1. Tables 3** to **8** also summaries the works schedule required to achieve the targets.

Table 2 – Summary of Regeneration Targets for Stage 1

Year	Abundance of Natives (%)	Cover of Native (%)	Cover of Biosecurity Weeds (%)	Cover of Other Priority Weeds (%)	Pasture Grasses (%)
1	30	30	<75	<75	<80
2	40	45	<50	<45	<50
3	55	55	<40	<30	<35
4	60	65	<25	<25	<20
5	70	80	<10	<15	<10

5.0 Regeneration Management

5.1 Site Preparation

Prior to the commencement of regeneration, the vMP Lands must be prepared. The following works have been recommended to assist in site preparation:

- Establishment of pathogens and diseases controls. Diseases which could affect the site include Myrtle rust (*Puccinia psidii*), affecting Myrtaceous plants, including *Melaleuca* species, and Amphibian Chytrid fungus disease, Chytridiomycosis, caused by Chytrid fungus (*Batrachochytrium dendrobatidis*). Appropriate hygiene controls are to be employed to minimise the chances of any such introduction occurring. This may include a hygiene station equipped with sterilizing agents and cleaning equipment to clean boots, tools and machinery. Response plans are needed to be designed and implemented to mitigate impacts in the event of disease or pathogen outbreaks;
- All extant rubbish/waste is to be removed from VMP lands including farm fencing and structures. The need to remove such material should be assessed on a case-by-case basis as in some instances the material is inert, such as concrete, rocks and timber posts, etc. Such material may inadvertently provide geomorphic stability;
- Clearly mark native vegetation for retention and approved removal;
- Install temporary fence around the VMP Lands, and clearly mark as a "No Go Area" prior to commencement of civil works;
- Fencing should have clearly visible signage erected at key entry points to VMP;
- Implement erosion and sediment control measures in accordance with specifications set out in the latest edition of the Landcom publication "Soils and Constructions – Volume 1" (The Blue Book);
- Establish monitoring and photo points;
- Vegetation clearing;
- Determine baseline data;
- Primary weed removal;
- Installation of ground habitat;
- Planting of Vegetation (see **Appendix B** for a detailed species list). All plant stock must be provenance specific seed/ material collected from locally endemic species, grown by suitably experienced and qualified nurseries, and hardened-off before planting. This will ensure the structure and composition of these communities will meet the targets set; and
- Mulching and watering.

5.2 Baseline Data

Indicative monitoring points have been identified within the VMP Lands (refer **Figure 4)**. The final location of the monitoring points is to be determined when commencing works, as environmental conditions change over time and the indicative locations may not be reflective of the communities at the time of commencement.

Baseline data will cover:

- Species diversity (both native and exotic);
- Species Abundance (both native and exotic);
- Overall health of the VMP Lands;
- Photos in north, east, south and west aspects; and
- Record incidental fauna.

The Monitoring Points established for the baseline surveys will then be monitored on a biannual basis.

5.3 Vegetation Clearing

For the clearing phase, retained vegetation will be delineated by safety bunting flags, fencing and signage indicating environmental protection zone, which will still allow fauna to egress the development area as needed. Following the completion of clearing works, permanent delineation features such as logs should be installed to protect the retained vegetation during operational phase of the development:

- Vegetation clearing should be timed to avoid cold weather periods where overnight temperatures are forecast to be less than 12°C. Cold weather is likely to make it difficult for resident hollow dependent fauna to successfully relocate. This is particularly relevant for low body-weight species;
- A staged approach to clearing is to be undertaken to provide fauna the opportunity to disperse outside the area of impact. Staging to include Phase 1 Clearing: Underscrubbing, Phase 2 Clearing: Removal of non-habitat trees, and Phase 3 Clearing: Removal of habitat and connecting trees;
- All clearing works (phase 1-3) to be undertaken under the supervision of the Project Ecologist;
- Clearing should occur in a direction from previously disturbed lands towards retained lands;
- Implement clearing protocols, including pre-clearance surveys to identify habitat and vegetation to be retained;
- All clearing works to be attended by a suitable equipped and experienced ecologist to deal appropriately with any displaced fauna species;
- All hollow bearing features will be sectionally lowered by tree climbers (where safe to do so);
- Any fauna rescued during vegetation clearing is to be assessed for injuries, and subsequently released to a suitable nearby location; this may require holding fauna until dusk for release in accordance with relevant animal ethics licencing and standards;
- If any fauna is injured during vegetation clearing, they are to be taken promptly to a nearby veterinarian or suitable wildlife carer contact;
- In addition, prior to clearing of any vegetation, an ecologist is to inspect the area for any signs of resident fauna requiring attention, and in particular nesting birds. Where such is identified, appropriate strategies are to be developed and instigated to minimise impacts.
- Pre-clearance surveys to include diurnal surveys, stagwatching and nocturnal surveys;
- Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection;
- Installation of nest boxes within the retained lands prior to construction to mitigate the removal of HBTs within the development footprint and provide supplementary roosting / nesting habitat for resident fauna species that utilise such features.
- Any suitable hollows recovered during clearing works should be reconditioned into suitable hollows and installed in retained lands in addition to the manufactured nest boxes; and
- All cleared vegetation is to be mulched on site and spread to help stabilise any exposed soil and minimise offsite movement of biomass. Fallen timber and hollow logs identified to be retained to be relocated into the retained lands.

5.4 Weed Management

Weed Control works within each Management Zone are to be undertaken by a qualified bushland regeneration team using industry standards (summary provided in **Table 2**).

Any reproductive material of weeds, including weeds that can spread vegetatively or seeds, must be taken off site to be disposed of at an appropriate local waste collection service. No weed material with the potential of spreading may be stockpiled within the Subject Site, or the VMP Lands.

The *Biosecurity Act 2015* outlines several 'duties'; the general biosecurity duty, and additional duties under mandatory measures, regional measures, prohibited matter or biosecurity zone. Specific actions for these measures may be required. Weed control is required to occur in the following sequence:

1. **Primary Weeding** – this is where weeds are removed from Management Zones.
2. **Consolidation** – over the next few months, the weed control zones will require monthly visits to remove weeds that are regenerating and/or have grown in response to the disturbance and are competing with planted and regenerating native plants. These visits are essential, otherwise the weeds will recolonise, dominate and inhibit the regeneration of native species.
3. **Maintenance Weeding** – After the sixth-month and will continue on a monthly basis, due to woody weeds, and other annual weeds being problematic within the locality.

This interval will be evaluated based on-site condition during each monitoring period. Weed control works across the site are to be undertaken over the maintenance period of five (5) years, however given the adaptive management approach, this time-frame is flexible, and may need to be extended based on changing site conditions and results indicating management zones have reached targets set out in this VMP.

5.5 Fauna Management

Macropods and possums were recorded as occurring onsite and in the local area. Therefore, protection guards should be placed around plantings so that revegetation efforts within VMP lands are not compromised by grazing. If monitoring within management zones indicates pest species pose notable impediments to achieving the aims of the VMP (i.e., through excessive browsing, etc.), then management actions will be reviewed to address these issues.

Incidental fauna records are to be undertaken during monitoring surveys and reported.

6.0 Project Management

Establishment of monitoring points and compliance checking of other aspects within this VMP will be the responsibility of the Project Ecologist working with the Civil Contractor.

The client will be responsible for the engagement of a suitably qualified Bush Regeneration Contractor to undertake weed control and planting works outlined in this VMP.

Bush Regenerator(s) or company(s) shall have the following qualifications;

- Australian Association of Bush Regenerators (AABR) Accreditation. The Bush Regenerators shall hold a current AQF3 qualification.
- Site Supervisor must have demonstrated minimum of 2 years' experience in the bush regeneration or related field and must have experience at a supervisory level in providing training, supervision and technical advice to staff, clients, volunteers and members of the public.
- The Site Supervisor must hold a current AQF 3 qualification or higher and must have completed the Bush Regeneration Level IV Certificate or have a diploma or degree in a field related to natural resource management.

The Project Ecologist will be responsible for the establishment of monitoring points within the VMP lands along with collection of baseline data that will be monitored against this over the three-year period of this VMP with the overall targets. The Project Ecologist will be responsible for monitoring and reporting on weed management, and Regeneration Approach success.

6.1 Monitoring

Monitoring will occur at commencement and biannual basis at the proposed monitoring points (refer **Figure 4**).

6.1.1 Baseline Data

Baseline data is collected at commencement of the VMP refer **Section 5.2**.

6.1.2 Biannual Monitoring

This is to occur every 6months from commencements up to three years or reaching of targets (which every is the latter);

- Weed species, coverage and location;
- Native species, coverage and location;
- Effectiveness of weed control methods;
- Photo records at monitoring points at each aspect (North, east, south, west);
- General health of each Management Zone;
- Incidental fauna use of site; and

Evaluation of management effectiveness.

6.2 Reporting

A baseline report is prepared at commencement of the VMP and submitted to Council.

A report is to be prepared annually and delivered to the consent authority for the life of the VMP with a final report prepared at the end of the VMP outlining how the conditions of the VMP have been met.

Biannual monitoring will inform the evaluation of management effectiveness, until the Regeneration Benchmark Targets are met.

As part of adaptive management, the reports will include evaluations and recommendations relating to all areas covered in the monitoring schedule and also address any other problems or deficiencies found during monitoring. If required the report should also outline any changes that are required to planned works to ensure better ecological outcomes.

Regeneration of the VMP Lands will be undertaken over a period of five (5) years or until the Year five (5) overall targets are reached. As the VMP lands will then be in a state of Natural Regeneration, management of the site after targets have been achieved will be undertaken in accordance with the *Biosecurity Act 2015* & *Biosecurity Regulations 2017*.

Table 3 – Weed Control Activities

Activity	Minimum Requirement
Pre-works	Undertake baseline surveys to identify priority weeds present on site to be the focus of weed management activities. Priority weeds based on listings under the *Biosecurity Act 2015*, and notably problematic weeds on site have been identified, and listed in **Section 2.2**.
Primary Works	Effectively control priority species and areas through appropriate methods to eliminate highly competitive weeds from an area. Include high disturbance activities that could negatively impact later regeneration such as high-volume herbicide application, and physical removal of large trees which would pose safety hazards to the public or others if left to perish *in-situ*.
Secondary Works	Treat any regrowth from primary weed control and expand on control measures by targeting Priority species and expanding the primary control boundaries where desirable. Thin retained weeds to increase light penetration where appropriate. Generally, expand on and solidify primary work.
Maintenance Works	Maintain exclusion of weeds controlled during Primary and Secondary works. Prevent reinfestation of weeds progressively, and others as time permits.
Woody Trees & Shrubs	Where appropriate, remove trees via mechanical means (i.e., chainsaw or handsaw) and apply chemical to the cut stump. Material may be retained on-Site or disposed of appropriately off-Site. Retained material should be situated to provide additional ground habitat and slope stability but should not be left in such a way that would hamper natural regeneration or existing native plants. Care should be taken with species which have the capacity to regrow vegetatively such as *Erythrina x sykesii* (Coral Tree). Alternatively, trees and shrubs may be treated via frill or drill application of herbicide and left to perish *in-situ* as habitat.
Woody Thickets	Treat via cut or scrape and paint or high-concentration low-volume foliar herbicide control (i.e., splatter application). Material may be left *in-situ* (particularly after spraying) or broken up and rafted off the ground to perish (taking care to remove from expected high flow areas of the dam). Do not manually remove root stock in a manner that will encourage soil instability or erosion. Once dead, standing material may be broken down and left on the ground as mulch. Mechanical removal (i.e., brush cutter equipped with mulching blade or similar) may be used where practical and regrowth treated with foliar application of herbicide.
Vines and Creepers	Skirt from trees and vegetation to prevent smothering and leave material to perish *in-situ*. Cut or scrape and paint stems or runners. Foliar herbicide control where appropriate. Do not unduly expose soil via manual removal of plants where they may be providing soil stabilisation. Isolated manual removal as appropriate.
Ground Cover	Retain exotic species where they are providing ground stabilisation or habitat until such time as they hinder native species establishment or are no longer necessary. Relevant examples include retaining *Tradescantia fluminensis* (Trad) along drainage lines where removal would expose bare soil to erosion. Weed control is to focus on the patch removal of such weeds from around native regeneration or planting, with progressive removal of larger patches over time.
Retention of forage/habitat	Retain trees and shrubs that have evidence of occupation i.e., bird nest/possum drey, until such time as other suitable habitat is available or the nest is abandoned. Retain manageable clumps of vegetation that can be easily removed at a later date for intermediate food and habitat supply within the semi-cleared and disturbed landscape, which will emerge between weed control and establishment of native plants.
	These retained features can be removed as they become redundant at the discretion of the Bush Regeneration Contractor (BRC).

Prior to commencement of the VMP the following must have been undertaken:

- Development of Stage 1 Treatment / Monitoring Plan for *Rhodamnia rubescens; and*
- Peer review and finalisation of Stage 1 Treatment / Monitoring Plan for *Rhodamnia rubescens.*

It should be noted that the Treatment and Monitoring Plan Schedule of works will be provided to Council with the Baseline Data Report.

Table 4 – Year 1 Targets and Schedule of Works for Stage 1

Timeframe	Works to be Undertaken	1st Quarter of Year	2nd Quarter of Year	3rd Quarter of Year	4th Quarter of Year	Targets to be reached at end of 4th Quarter				
						Abundance of Natives (%)	Cover of Native (%)	Cover of Biosecurity Weeds (%)	Cover of Other Priority Weeds (%)	Pasture Grasses (%)
Year 1	Installation of No-Go Zones, fencing and signs					30	30	<75	<75	<80
	Installation of Monitoring Points									
	Collection of baseline data									
	Installation of sediment and erosion controls									
	Installation of Ground habitat									
	Preparation of Baseline Data Report									
	Primary Weeding (Effectively control priority species and areas through appropriate methods to eliminate highly competitive weeds from an area. Include high disturbance activities that could negatively impact later regeneration such as high-volume herbicide application, and physical removal of large trees which would pose safety hazards to the public or others if left to perish *in-situ)* of all zones – focus is on Biosecurity Weeds (refer **Appendix C** for Department of Primary Industries Priority Weeds for the Central Coast)									
	Mass planting of trees and shrubs within reconstruction zones (refer to **Appendix B** for suitable plants in each PCT)									
	Installation of tree guards for pest control if required									
	Secondary Weeding- focus is on Biosecurity Weeds (refer **Appendix C** for Department of Primary Industries Priority Weeds for the Central Coast)									
	Replacement dead / dying plantings									
	Biannual monitoring									
	Annual Reporting to Council									
On completion of year 1 the entire VMP Land will be in a state of Ecological Regeneration in accordance with Society for Ecological Restoration Australasia (2018) *National standards for the practice of ecological restoration in Australia.*										

Table 5 – Year 2 Targets and Schedule of Works for Stage 1

Timeframe	Works to be Undertaken	1st Quarter of Year	2nd Quarter of Year	3rd Quarter of Year	4th Quarter of Year	Targets to be reached at end of 4th Quarter				
						Abundance of Natives (%)	Cover of Native (%)	Cover of Biosecurity Weeds (%)	Cover of Other Priority Weeds (%)	Pasture Grasses (%)
Year 2	Annual inspection of No-Go Zones, fencing and signs	■				40	45	<50	<45	<50
	Annual inspection of sediment and erosion controls (or after rainfall events)	■								
	Annual inspection of ground habitat		■							
	Replacing dead / dying plantings		■		■					
	Weed management as required to achieve annual targets	■	■	■	■					
	Replacement of dead or dying plants		■		■					
	Biannual monitoring of both terrestrial and aquatic environments including water quality data		■		■					
	Biannual inspection or Installation of tree guards for pest control if required		■		■					
	Annual Reporting to Council				■					
At end of second year the entire VMP Land will be a state of Ecological Regeneration in accordance with Society for Ecological Restoration Australasia (2018) National standards for the practice of ecological restoration in Australia.										

Table 6 – Year 3 Targets and Schedule of Works for Stage 1

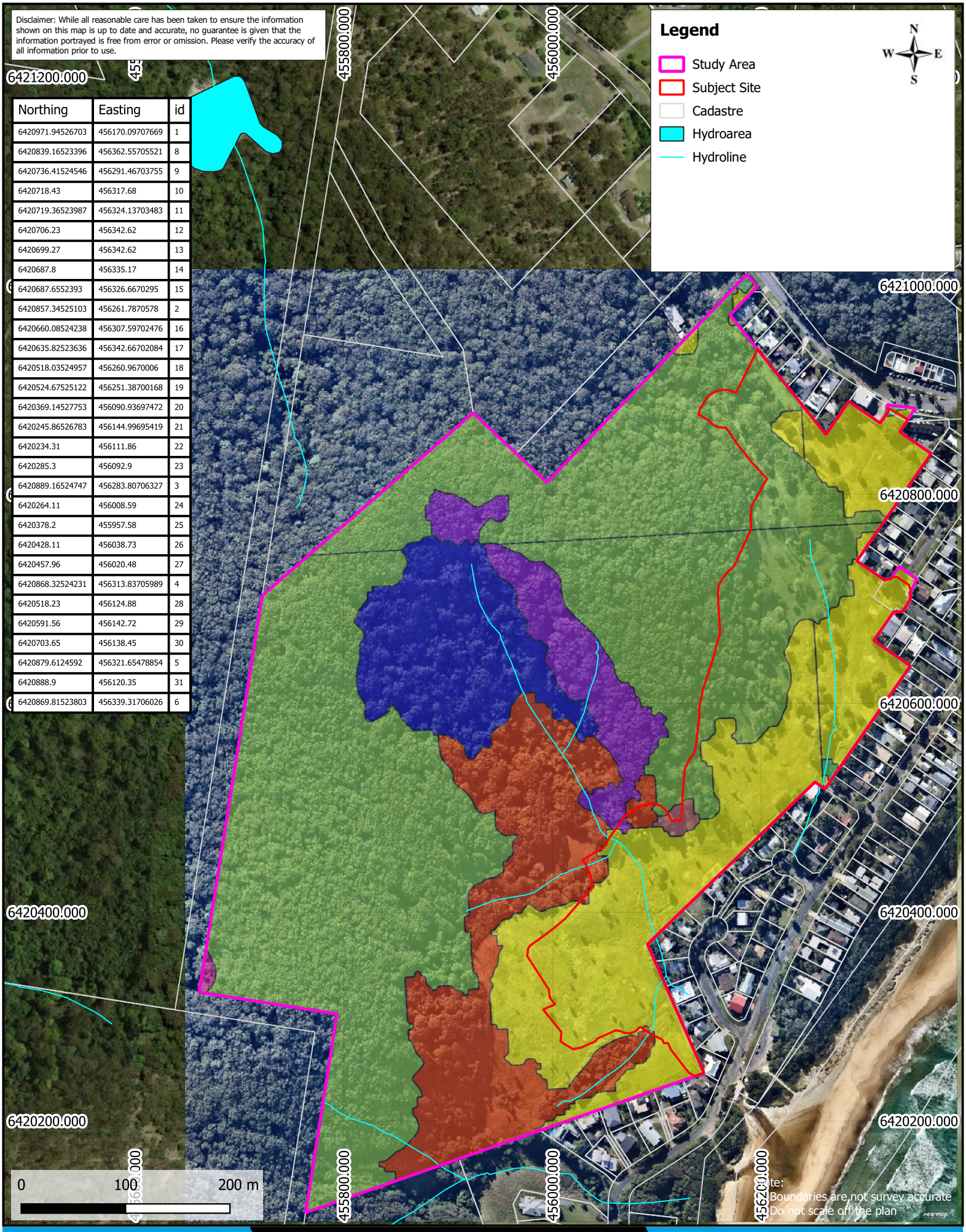
Timeframe	Works to be Undertaken	1st Quarter of Year	2nd Quarter of Year	3rd Quarter of Year	4th Quarter of Year	Targets to be reached at end of 4th Quarter				
						Abundance of Natives (%)	Cover of Native (%)	Cover of Biosecurity Weeds (%)	Cover of Other Priority Weeds (%)	Pasture Grasses (%)
Year 3	Annual inspection of no-go Zones, fencing and signs	■				55	55	<40	<30	<35
	Annual inspection of sediment and erosion controls (or after rainfall events)	■								
	Annual inspection of ground habitat		■							
	Weed management as required to achieve annual targets	■	■	■	■					
	Biannual monitoring of both terrestrial and aquatic environments including water quality data		■		■					
	Replacement of dead or dying plants		■		■					
	Direct seeding of groundcover species in all Zones if required				■					
	Biannual inspection or Installation of tree guards for pest control if required		■		■					
	Review of VMP success and failures and update where appropriate for submission with Annual Report to CCC				■					
	Annual Reporting to Council				■					
At end of third year the entire VMP Land will be a state of Facilitated Regeneration Approach in accordance with Society for Ecological Restoration Australasia (2018) *National standards for the practice of ecological restoration in Australia.*										

Table 7 – Year 4 Targets and Schedule of Works for Stage 1

Timeframe	Works to be Undertaken	1st Quarter of Year	2nd Quarter of Year	3rd Quarter of Year	4th Quarter of Year	Targets to be reached at end of 4th Quarter				
						Abundance of Natives (%)	Cover of Native (%)	Cover of Biosecurity Weeds (%)	Cover of Other Priority Weeds (%)	Pasture Grasses (%)
Year 4	Annual inspection of sediment and erosion controls (or after rainfall events)					60	65	<25	<25	<20
	Annual inspection of ground habitat									
	Weed management as required to achieve annual targets									
	Biannual monitoring of both terrestrial and aquatic environments including water quality data									
	Annual Reporting to Council									
At end of second year the entire VMP Land will be a state of Facilitated Regeneration Approach in accordance with Society for Ecological Restoration Australasia (2018) National standards for the practice of ecological restoration in Australia.										

Table 8 – Year 5 Targets and Schedule of Works for Stage 1

Timeframe	Works to be Undertaken	1st Quarter of Year	2nd Quarter of Year	3rd Quarter of Year	4th Quarter of Year	Targets to be reached at end of 4th Quarter				
						Abundance of Natives (%)	Cover of Native (%)	Cover of Biosecurity Weeds (%)	Cover of Other Priority Weeds (%)	Pasture Grasses (%)
Year 5	Annual inspection of sediment and erosion controls (or after rainfall events)					70	80	<10	<15	<10
	Annual inspection of ground habitat									
	Weed management as required to achieve annual targets									
	Biannual monitoring of both terrestrial and aquatic environments including water quality data									
	Final Reporting to Council									
At end of second year the entire VMP Land will be a state of Natural Regeneration Approach in accordance with Society for Ecological Restoration Australasia (2018) National standards for the practice of ecological restoration in Australia.										



Northing	Easting	id
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6420839.16523396	456362.55705521	8
6420736.41524546	456291.46703755	9
6420718.43	456317.68	10
6420719.36523987	456324.13703483	11
6420706.23	456342.62	12
6420699.27	456342.62	13
6420687.8	456335.17	14
6420687.6552393	456326.6670295	15
6420857.34525103	456261.7870578	2
6420660.08524238	456307.59702476	16
6420635.82523636	456342.66702084	17
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6420234.31	456111.86	22
6420285.3	456092.9	23
6420889.16524747	456283.80706327	3
6420264.11	456008.59	24
6420378.2	455957.58	25
6420428.11	456038.73	26
6420457.96	456020.48	27
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6420591.56	456142.72	29
6420703.65	456138.45	30
6420879.6124592	456321.65478854	5
6420888.9	456120.35	31
6420869.81523803	456339.31706026	6

AEP

Figure 1 - Site Map

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

BOAMS: 00030048

Client: Addenbrooke Pty Ltd

AEP ref: 2506.03

DATE PLOTTED: 17 August 2022 5:13 PM BY : MARIO QUITORIANO

XREFs: X-Base, GISextract_20211013, X-ROAD NAMES, X-Ecological Constraints; CONTS DESIGN-1000, X-Final Cad Base_Option E, X-Final Lot Areas_Option E, CONTS DESIGN EXISTING-1000, X-PROPOSED SERVICES, X-Limit of Works-BOY, X- PROPOSED STORMWATER

CAD File: N:\Projects\50\5\FY22\033_BLUEYS BEACH DA\Drawings\Build\DA\50522033-C-1004-OGA.dwg

LEGEND

- LIMIT OF WORK
- SW — PROPOSED STORMWATER
- S — PROPOSED SEWER
- W — PROPOSED WATER
- COM — PROPOSED TELECOM
- PROPOSED SWALE
- PROPOSED 4.5m FRONT SETBACK
- PROPOSED 3.0m EASEMENT
- PROPOSED RETAINING WALL
- PROPOSED RAIN GARDEN

NORTH

BOOMERANG DRIVE

RHODAMNIA RUBESCENS TREE CLUSTER

NON EXCLUSION ZONE

PROPOSED POND 02

POND 02

PCT1525 CLUSTER

PROPOSED POND 01

POND 01 Y2 1817m²

PROPOSED CROLL STREET/VIEW STREET ROUNDABOUT

CROLL STREET

VIEW STREET

AMPAT PLACE

ALAMAU PL

SAMUEL ST

NEWMAN AVENUE

ROAD 01

ROAD 02

ROAD 03

ROAD 04

C	18/08/2022	FOR DA SUBMISSION	TM/ML	GZ	JS	
B	17/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS	
A	09/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS	
Rev.	Date	Description	Des.	Verif.	Appd.	

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Checked	AS/TM	Date 09/05/2022
Designed	TM/ML	Date 09/05/2022
Verified	GZ	Date 09/05/2022
Approved	JS	09/05/2022

Client: BLUEYS BEACH ESTATE

Project: BLUEYS BEACH DEVELOPMENT
BOOMERANG DRIVE, BLUEYS BEACH, NEW SOUTH WALES

Title: OVERALL GENERAL ARRANGEMENT PLAN

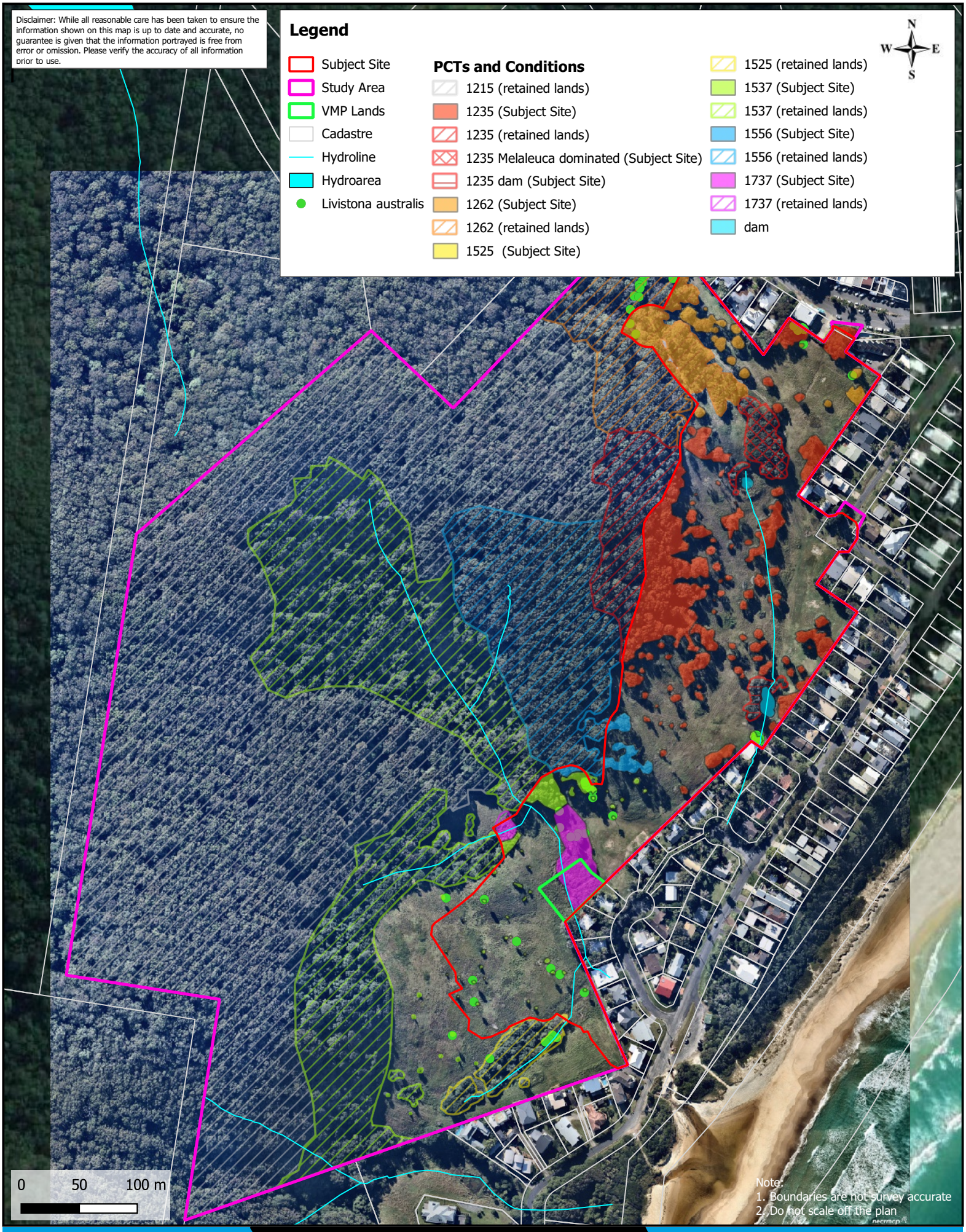
Status: FOR APPROVAL
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Date	Datum	Scale	Size
09/05/2022	AHD	1:1000	A1

Drawing Number: 50522033-C-1004

Revision: C

SCALE 1:1000 @A1



AEP

Figure 3 - VMP PCTs

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

Client:Addenbrooke Pty Ltd

AEP ref: 2506.05

AEP

Figure 4 - Management Zones

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

Client: Addenbrooke Pty Ltd

AEP ref: 2506.05

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Appendix A – Regeneration Species List

Species List – Approximate densities and species for regeneration.

It should be noted that not all of the listed species above are easily obtainable, substitutions to be made on the advice of bush regeneration contractor or Project Ecologist.

Canopy	Density	Shrubs	Density	Ground Cover	Density
Aquatic Species – Low Flow Channel to Upper Toe					
Not Applicable in this Management Zone	N/A	Not Applicable in this Management Zone	N/A	*Cyperus gracilis*	6 to 8 /1m^2
				Juncus usitatus	
				Carex longebrachiata	
				Lomandra longifolia	
				Gahnia clarkei	
PCT 1537					
Cupaniopsis anacardioides	1/30 m^2	*Wilkiea huegeliana*	1/10m^2	*Pellaea falcata*	5/m^2 or Direct Seeding
Elaeodendron australe		*Sarcomelicope simplicifolia*		*Doodia aspera*	
Drypetes deplanchei		*Pittosporum revolutum*		*Dianella caerulea*	
Planchonella australis		*Diospyros australis;*			
Ficus rubiginosa					
Elaeocarpus obovatus		*Claoxylon australe;*			
Livistona australis		*Guioa semiglauca;*			
Alphitonia excelsa		*Cissus antarctica;*			
		Smilax australis;			
Ficus fraseri		*Dioscorea transversa;*			
Acmena smithii		*Parsonsia straminea;*			

Appendix B – Authors' CVs

Dennis Neader

Curriculum Vitae

Dennis works with AEP in the role of senior ecologist. He is an experienced bird watcher and a regular participant in Hunter Bird Observers' Club (HBOC) Bird Surveys in the wider Hunter Valley. Dennis has previously had a varied career as an environmental scientist, contaminated land consultant and bush regenerator with local firms. His background in birdwatching, post-approval project management and bush regeneration, combined with his ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Bachelor of Science (Environmental Geoscience) University of Newcastle (2011).
- Graduate Diploma in Environmental Management University of Newcastle (2 subjects to complete) (2014).

Further Education & Training

- NSW Class HR Driver's Licence.
- Experienced 4WD operator.
- Current Senior First Aid.
- Occupational Health & Safety Training.
- High Risk NSW Elevated Work Platform, Dogging and Light Forklift Truck.
- Open Water PADI Dive Certificate.
- Non-Friable Asbestos Removal.
- Chainsaw Operation and Maintenance.

Fields of Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna.
- Avifauna surveys, including challenging wetland and bushland environs.
- Field transect survey for cryptic flora species.
- Field survey for terrestrial fauna species including bird and reptile survey, koala habitat and SAT assessment, microbat, mammal track, scat identification and herpetological survey.
- Spotlighting, call playback, and stagwatch for arboreal mammal species, including Forest Owls, Squirrel Glider and Koala.
- Trapping and translocation works with mammals, reptiles and amphibians.
- Remote trapping including SongMeter and camera trapping emplacement and analysis.
- Post-approval Project management including Fauna Welfare.
- Bush regeneration.
- Native plant ID and seed collection.

- Contaminated Land – Asbestos Identification and Removal.

Relevant Employment History

2016 – Present **Senior Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, rehabilitation, advices, strategy and representation.

2014 - 2016 **Environmental Scientist**
JM Environments, Newcastle

As an environmental scientist with JM Environments, I was responsible for ecological surveys and reporting, water and air quality monitoring, calibration and maintenance of monitoring equipment, contaminated land Phase 1, 2 and 3 assessments, Remediation Action Plan preparation and project management, development of safe work procedures and safety inspections on site. I was responsible for ensuring projects were completed on time and on budget whilst meeting clients' expectations and achieving quality assurance standards.

2010 - 2014 **Environmental Techincian**
AECOM, Newcastle

Landscape Function Analysis surveys and reporting, water quality monitoring air quality monitoring.

2010 – 2014 **Contract GIS Technician**
Geodata, Newcastle

Data entry and interpretation of cadastral survey information into GeoCadastre and MapInfo software.

2006 – 2010 **Coal Superintending**
ALS & SGS Newcastle

Coal sampling, superintending and testing, sampling and data entry. Accurate, timely product processing and data entry of coal quality and analysis.

Pre 2006 Rigging, crane dogman, including outages and construction at major mine and building sites, self-employed in print industry

Relevant Ecological Experience

- 2011 – Current Bird Surveys
- Hunter Bird Observers Club – Shorebirds, Earthcare Park, Grahastown Dam Monthly Surveys
- Avifauna Baseline Surveys on Broughton Island.
- CVA Newcastle and Trees in Newcastle – Bird surveys in Hunter Valley for *Hunter Valley Stepping Stones Project Great Eastern Ranges* 2014-2017.

- NPWS - Population survey Gould's Petrel Cabbage Tree Island Port Stephens.
- 2008 – Current Bush Regeneration, Plant ID and Seed Collection
- CVA Newcastle and Trees in Newcastle.
- Blueys Beach DuneCare – Mid Coast Council Bush Regeneration.
- 2010 Volunteer Coral Reef Research
- University of Newcastle - Lady Elliot Island Queensland.

Professional Affiliations / Memberships

- Hunter Bird Observers' Club
- Birdlife Australia.
- Society for Growing Australian Plants.
- Australian Assoc. of Bush Regenerators.

Desktop and Site VMP works were undertaken by:

Staff	Title/Qualification	Tasks
Dennis Neader	Senior Ecologist BSc (Environment Geoscience) Grad Dip Env Mgt	Report Author, fauna surveys
Darcy Kilvert	Ecologist BSc (Biology)	Riparian assessment, flora surveys
Frances O'Brien	Senior Ecologist (Lead Botanist) BEnv LLB GDLP MEL BAAS: 20013	Flora surveys, PCT determination
Natalie Black	Senior Environmental Manager BSc (Hons), Master Planning, Cert IV (TA) BAAS: 19076	Technical Review

Appendix N – Wildlife Corridor Management Plan

ECOLOGY | BIOBANKING | OFFSETS | BUSHFIRE

Wildlife Corridor Management Plan

Residential Subdivision

Lot 23, Boomerang Drive,

Blueys Beach, NSW

Prepared for: Addenbrooke Pty Ltd

4 May 2022

AEP Ref: 2506.06

Revision: 00

P 0418 681 581 E CRAIG@ANDERSONEP.COM.AU PO BOX210 ADAMSTOWN NSW 2289 ABN 27 170 660 510

Document Control

Name	Wildlife Corridor Management Plan Residential Subdivision Lot 23, Boomerang Drive, Blueys Beach, NSW
Project Number	2506.06
Client Name	Addenbrooke Pty Ltd
AEP Project Team	Craig Anderson Dennis Neader Frances O'Brien Warwick Muir Darcy Kilvert Natalie Black Stevie Kay Kelly Drysdale Elli Emanuel Thomas Stephens Kathleen Bushell

Revision

Revision	Date	Author/s	Reviewed	Approved
00 - Draft	8 August 2022	Dennis Neader Kathleen Bushell	Frances O'Brien	
01	30 August 2022		Frances O'Brien	

Distribution

Revision	Date	Name	Organisation
00 - Draft	8 August 2022	Jack Joseph John Sutcliffe	W T Malouf Cardno/Stantec
01	30 August 2022	Jack Joseph John Sutcliffe	W T Malouf Cardno/Stantec

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1.0 Wildlife Corridor Management Plan

1.1 Introduction

A residential subdivision is proposed within land known as 23 Boomerang Drive, Blueys Beach NSW. At the request of W T Malouf on behalf of Addenbrooke Pty Ltd (the Proponent), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of a Wildlife Corridor Management Plan (WCMP) supporting the development application for a proposed residential subdivision and associated ancillary infrastructure.

The WCMP is a requirement of Mid Coast Council (Council) Development Control Plan (DCP) for Great Lakes region – S 16 Site Specific Controls - s 16.22.1.3 – "*Specific Controls for Wildlife Corridors*" which covers the Blueys Beach area, including the Development Lot 23 (the Subject Site).

Compliance of the WCMP with the DCP schedule is provided in **Appendix A**.

1.2 The Proposal

The proposed development involves land subdivision for residential purposes, which will require the clearance of approx. 2.88ha of native vegetation. The site currently contains previously grazed grassland (currently slashed) and remnant native vegetation.

Riparian and other retained lands within the Subject Site are proposed to be managed under a Biodiversity Management Plan being developed by AEP with the DA assessment.

1.3 Information Sources

Information and spatial data provided within this WCMP have been compiled from various sources including:

- Field surveys conducted within Lot 23 and wider Blueys Beach locality by AEP (2016-2022);
- State and federal survey guidelines (DEC 2004, SEWPaC 2011, DPIE 2020a and 2020b, OEH 2016, OEH 2018, OEH 2020);
- PlantNet NSW (https://plantnet.rbgsyd.nsw.gov.au/);
- Aerial Photograph Interpretation (API) of the site and surrounding locality;
- Review of regional mapping for the site (EcoLogical 2006, DPIE 2012, BoM 2021 and AEP 2021-2);
- NSW Threatened Biodiversity Profiles https://www.environment.nsw.gov.au/threatenedSpeciesApp/;
- Collective knowledge gained from previous ecological survey and assessment in the MidCoast Council area over the past 25 years;
- Anecdotal records;
- In addition, database searches were carried out, namely:
- Review of flora and fauna records held by DPIE BioNet Atlas of NSW Wildlife within a 10km search of the site (December 2021);
- Review of records held by the Commonwealth Department of Agriculture, Water and the Environment (DAWE) Protected Matters Search within a 5km radius of the site (December 2021); and
- Review of DPIE Important Area Maps (January 2022).

1.4 Subject Site Details

Table 1 – Site Particulars

Detail	Comments
Client	Addenbrooke Pty Ltd.
Address	23 Boomerang Drive, Blueys Beach NSW.
Title	Lot 23 DP 537919 (the Parent Lot).
LGA	Mid-Coast Council.
Zoning	Under the Great Lakes Local Environment Plan 2014 (the LEP), the Subject Site is zoned; B1 – Neighbourhood Centre, R2 – Low Density Residential, and C4 – Environmental Living. The Parent Lot also includes RU2 – Rural Landscape and C2 – Environmental Conservation.
Parent Lot Area	Comprises 35.08ha
Subject Site Area	Approx. 8.88ha in the east of the Parent Lot is proposed to be developed (see **Figure 1**).
Wildlife Corridor	The whole of the Parent Lot is mapped Wildlife Corridor Control (WCC) under the DCP. The WCC extends to the northeast of the Parent Lot across Boomerang Drive (see **Figure 1**).
Other Ecological Management Plans	A Vegetation Management Plan (VMP) is being developed at time of writing to guide rehabilitation of retained vegetation within the proposed development footprint.
Current Land Use	The Parent lot comprises 35.08ha, of which the western 34.2ha comprises mostly remnant native vegetation in varying degrees of structural health. The development footprint comprises approx. 8.88ha. and approx. 6.26ha of this in the east of the Subject Site has been historically grazed and otherwise managed. The western upslope area of the Subject Site includes approx. 2.62ha of disturbed native vegetation and a mosaic of ecotones has developed with regeneration and continued past disturbance. The Subject Site is currently unoccupied and contains a mosaic of improved pasture, derived native grassland, two constructed dams within drainage lines and remnant native vegetation ecotones in condition varying from poor to moderate quality.
Surrounding Land Use	The Site is bounded by residential and commercial development to the north and east, cleared land and vegetation to the south and remnant naïve vegetation to the west.

Figure 1 depicts the Subject Site within Parent Lot 23 and Council Wildlife Corridor Controls Mapping extent**.**

1.5 The Proposal

The proposed development involves the subdivision of the eastern portion of the Parent Lot for residential purposes (the Subject Site), which requires the clearance of approx. 8.88ha of disturbed and native vegetation and managed non-native grassland. Remnant riparian, asset protection zones and conservation land are proposed to be managed under a Vegetation Management Plan (VMP).

The proposed development plan is shown in **Figure 2.**

AEP

Figure 1 - Site Location and Wildlife Corridor Mapping Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

Client: Addenbrooke Pty Ltd AEP

ref: 2506.06

DATE PLOTTED: 17 August 2022 5:13 PM BY : MARIO QUITORIANO

XREFs: X-Base, GISextract_20211013, X-ROAD NAMES, X-Ecological Constraints; CONTS DESIGN-1000, X-Final Cad Base_Option E, X-Final Lot Areas_Option E, CONTS DESIGN EXISTING-1000, X-PROPOSED SERVICES, X-Limit of Works-BOY, X- PROPOSED STORMWATER

CAD File: N:\Projects\50\5\FY22\033_BLUEYS BEACH DA\Drawings\Build\DA\50522033-C-1004-OGA.dwg

LEGEND

- LIMIT OF WORK
- SW — PROPOSED STORMWATER
- S — PROPOSED SEWER
- W — PROPOSED WATER
- COM — PROPOSED TELECOM
- PROPOSED SWALE
- PROPOSED 4.5m FRONT SETBACK
- PROPOSED 3.0m EASEMENT
- PROPOSED RETAINING WALL
- PROPOSED RAIN GARDEN

NORTH

BOOMERANG DRIVE

RHODAMNIA RUBESCENS TREE CLUSTER

NON EXCLUSION ZONE

PROPOSED POND 02

POND 02

PCT1525 CLUSTER

PROPOSED POND 01

POND 01 Y2 1817m²

PROPOSED CROLL STREET/VIEW STREET ROUNDABOUT

CROLL STREET

VIEW STREET

AMPAT PLACE

ALAMAU PL

SAMUEL ST

NEWMAN AVENUE

ROAD 01

ROAD 02

ROAD 03

ROAD 04

C	18/08/2022	FOR DA SUBMISSION	TM/ML	GZ	JS	
B	17/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS	
A	09/05/2022	FOR DA SUBMISSION	TM/ML	GZ	JS	
Rev.	Date	Description	Des.	Verif.	Appd.	

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Drawing Number: 50522033-C-1004

Revision: C

SCALE 1:1000 @A1

2.0 Flora and Vegetation Community Impacts

2.1 Flora Assemblages

Previous vegetation datasets consulted include assessments for the Proposal by EcoLogical (2006), DPIE (2012) and DPE (2022). These datasets within the Subject Site were further developed by AEP in 2021-2022 surveys to identify constraints and opportunities.

While four (4) threatened vegetation communities (EECs) were identified within the Subject Site and would be impacted to different degrees by the proposal (see **Table 2)**, they exist in a highly disturbed state and degraded from historic grazing and management practises. One (1) specimen of the threatened flora species (*Rhodamnia rubescens*) would be impacted by the Proposal. The specimen is affected by *Austropuccinia psidii* (Myrtle Rust) to a large degree making it unlikely to be viable and unable to reproduce in the future. Proposed management actions are discussed in the VMP.

The vegetation communities mapped and their extent within the Subject Site are provided in **Table 2** and shown in **Figure 3.**

The Parent Lot has seven (7) PCTs in varying vegetation conditions from poor to moderate:

- PCT 1215 – Spotted Gum – Grey Ironbark open forest of the Macleay Valley lowlands;
- PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion, commensurate with EEC Swamp Sclerophyll Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions;
- PCT 1262 Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast;
- PCT 1525 - Sandpaper Fig - Whalebone Tree warm temperate rainforest, commensurate with EEC Lowland Rainforest in NSW North Coast and Sydney Basin Bioregions;
- PCT 1537 - Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast, commensurate with EEC Littoral Rainforest in NSW North Coast, Sydney Basin and South East Corner Bioregions;
- PCT 1556 Tallowwood – Smooth-barked Apple – Blackbutt grass tall open forest of the Central and lower North Coast, commensurate with EEC River-flat Eucalypt Forest on Coastal Floodplains of NSW North Coast, Sydney Basin and South East Corner Bioregions; and
- 1737 - Typha rushland, commensurate with EEC Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions.

The remaining vegetation within the Parent Lot is classed as non-native grassland / cleared.

The proposed development will impact on five (5) of the PCTs. However, vegetation within the Subject Site is of lower condition than vegetation in the remainder of the Study Area.

Table 2 – Ground-truthed Vegetation (TECs in bold)

Vegetation Community	Condition	Approx. area impacted by development (ha)	Remaining area in Parent Lot (ha)
PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion EEC	poor	1.58	1.01
PCT 1262 - Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	poor	0.55	1.71
PCT1525 - Sandpaper Fig - Whalebone Tree warm temperate rainforest EEC	poor	<0.01	0.33
PCT 1537 - Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum EEC	moderate	0.13	5.68
PCT 1556 - Tallowwood – Smooth-barked Apple – Blackbutt grassy tall open forest of the Central and lower North Coast EEC	poor	0.1	2.22
PCT 1737 - Typha rushland EEC	moderate	0.17	0.1
Non-native grassland and cleared (Not a PCT)	poor	6.2	N/A

Disclaimer: While all reasonable care has been taken to ensure the information shown on this map is up to date and accurate, no guarantee is given that the information portrayed is free from error or omission. Please verify the accuracy of all information prior to use.

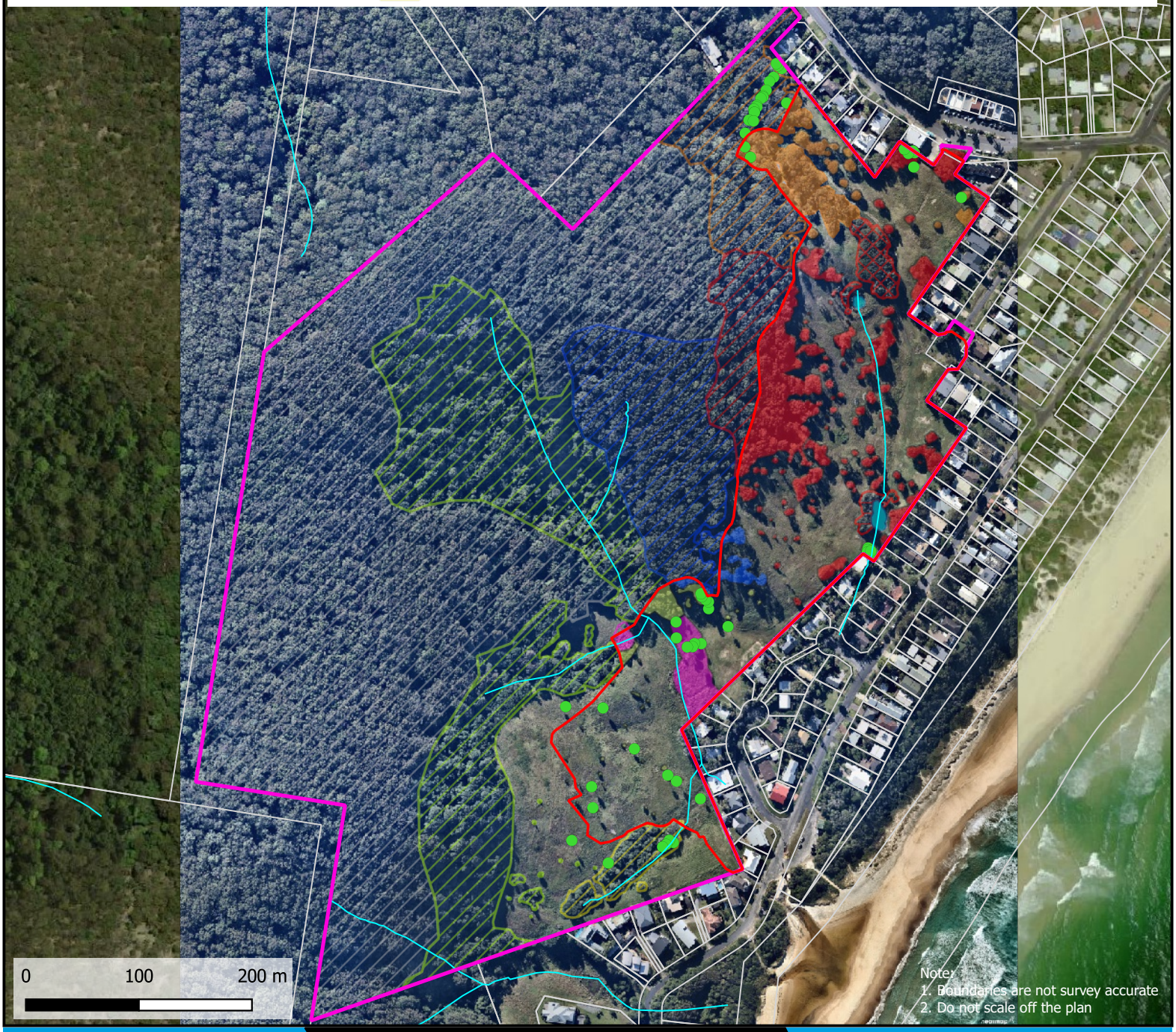
Legend

- Study Area
- Subject Site
- Hydroline
- Cadastre
- Livistona australis

Ground-truthed Vegetation

- 1215 - Spotted Gum - Grey Ironbark open forest of the Macleay Valley lowlands (retained lands)
- 1235 - Swamp Oak swamp forest of the coastal lowlands (Subject Site)
- 1235 (retained lands)
- 1235 Melaleuca-dominated (Subject Site)
- 1235 dam (Subject Site)
- 1262 - Tallowwood - Small-fruited Grey Gum dry grassy open forest of the foothills of NSW North Coast (Subject Site)
- 1262 (retained lands)
- 1525 - Sandpaper Fig - Whalebone Tree warm temperate rainforest (Subject Site)
- 1525 (retained lands)
- 1537 - Tuckeroo - Yellow Tulipwood - Red-fruited Olive Plum Littoral Rainforest of the lower North Coast (Subject Site)
- 1537 (retained lands)
- 1556 - Tallowwood - Smooth-barked Apple - Blackbutt grass tall open forest of the Central and lower North Coast (Subject Site)
- 1556 (retained lands)
- 1737 - Typha rushland (Subject Site)
- 1737 (retained lands)
- dam

N W E S



Note:
1. Boundaries are not survey accurate
2. Do not scale off the plan

AEP

Figure 3 - Ground-truthed Vegetation and Livistona locations | Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach | BOAMS: 00030048

Client: Addenbrooke Pty Ltd | AEP ref: 2506.03

2.2 Threatened Flora Species and Communities

While the majority of the proposed development footprint is cleared land, some remnant pockets of native vegetation would be impacted by the Proposal.

Potential for presence of threatened species was recently undertaken by AEP for assessment under the BAM and full assessment provided in the BDAR (AEP 2022). A summary of the potential for impacts upon threatened flora species and corridor integrity by the Proposal is provided below in **Tables 3 - 4**.

Table 3 – Threatened Flora

Species	Likelihood of Impact on Wildlife Corridor
Trailing Woodruff *Asperula asthenes*	While albeit marginal potential habitat for the species in drainage lines would be impacted by the development, the species was not identified in assessment despite targeted survey and the Wildlife Corridor unlikely to be impacted by the proposal.
Leafless Tongue Orchid *Cryptostylis hunteriana*	While albeit marginal potential habitat for the species is present, the species was not identified in targeted survey, hence Wildlife Corridor unlikely to be impacted by the Proposal.
White-flowered Wax Plant *Cynanchum elegans*	While albeit marginal potential habitat for the species in drainage lines would be impacted by the development, the species was not identified in assessment despite targeted survey and the Wildlife Corridor is unlikely to be impacted by the Proposal.
Rough Doubletail *Diuris praecox*	While potential habitat for *D. praecox* would be impacted by the development, the Wildlife Corridor is unlikely to be impacted by the Proposal.
Slaty Red Gum *Eucalyptus glaucina*	While albeit marginal potential habitat for the species was found in the Subject Site the species was not identified in targeted survey. Better habitat in retained vegetation in Parent Lot. Habitat for *E. glaucina* will be improved within retained vegetation within Lot 23 under various management plans including the VMP, hence viability of the Wildlife Corridor unlikely to be impacted.
Noah's False Chickweed *Lindernia alsinoides*	While albeit marginal potential habitat for the species in drainage lines would be impacted by the development, the species was not identified in assessment despite targeted survey and the Wildlife Corridor unlikely to be impacted by the Proposal.
Maundia triglochinoides	While albeit marginal potential habitat for the species in drainage lines would be impacted by the development, the species was not identified in assessment despite targeted survey and the Wildlife Corridor unlikely to be impacted by the Proposal.
Biconvex Paperbark *Melaleuca biconvexa*	While albeit marginal potential habitat for the species near drainage lines would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor unlikely to be impacted by the Proposal.
Grove's Paperbark *Melaleuca groveana*	While albeit marginal potential habitat for the species in the Subject Site would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor unlikely to be impacted by the Proposal.
Tall Knotweed *Persicaria elatior*	While albeit marginal potential habitat for the species near drainage lines would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor unlikely to be impacted by the Proposal.
Scant Pomaderris *Pomaderris queenslandica*	While albeit marginal potential habitat for the species near drainage lines would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor unlikely to be impacted by the Proposal.
Eastern Australian Underground Orchid *Rhizanthella slateri*	While albeit marginal potential habitat for the species would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor unlikely to be impacted by the Proposal.
Scrub Turpentine *Rhodamnia rubescens*	While albeit marginal potential habitat for the species would be impacted by the development, the species was identified in adjacent retained conservation lands. Four specimens recorded in surveys in adjoining retained lands. While one specimen severely impacted by Myrtle Rust would be removed, it is considered unlikely the Proposal would cause serious impact on the local population.
Native Guava *Rhodomyrtus psidioides*	While albeit marginal potential habitat for the species would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor is considered unlikely to be impacted by the Proposal.
Rainforest Cassia *Senna acclinis*	While albeit marginal potential habitat for the species would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor is considered unlikely to be impacted by the Proposal.

Species	Likelihood of Impact on Wildlife Corridor
Magenta Lilly Pilly *Syzygium paniculatum*	While albeit marginal potential habitat for the species would be impacted by the development, the species was not identified in targeted survey and the Wildlife Corridor is considered unlikely to be impacted by the Proposal.

Table 4 - Threatened Ecological Communities

Endangered Ecological Communities	
PCT 1235 - Swamp Oak swamp forest of the coastal lowlands of the NSW North Coast Bioregion	1.58ha impacted, albeit highly disturbed. Habitat for the community will be improved within retained vegetation within Lot 23 under various management plans including the VMP, hence overall viability of the Wildlife Corridor unlikely to be impacted.
PCT 1537 - Tuckeroo - Yellow Tulipwood - Red fruited Olive Plum Littoral Rainforest of the lower North Coast	0.13ha impacted, albeit highly disturbed. Habitat for the community will be improved within retained vegetation within Lot 23 under various management plans including the VMP, hence overall viability of the Wildlife Corridor unlikely to be impacted.
PCT1525 - Sandpaper Fig - Whalebone Tree warm temperate rainforest	Less than 0.01ha impacted. The majority of this PCT will be retained under a proposed biodiversity stewardship site.
PCT 1556 Tallowwood – Smooth-barked Apple – Blackbutt grass tall open forest of the Central and lower North Coast	0.1ha impacted, albeit highly disturbed. Habitat for the community will be improved within retained vegetation within Lot 23 under various management plans including the VMP, hence overall viability of the Wildlife Corridor unlikely to be impacted.
1737 - Typha rushland	0.26ha of highly disturbed and weedy community removed. Habitat for the community will be improved within retained vegetation in Lot 23 under various management plans including the VMP, hence overall viability of the Wildlife Corridor unlikely to be impacted.
Total	**2.07ha**

2.3 Non-native Flora and High Threat Weeds

Approx. 6.7ha of the Subject Site has been identified as non-native vegetation and cleared land containing previously grazed paddocks and several dams. It is almost entirely devoid of native species and is dominated by non-native grasses such as *Cenchrus clandestinus* (Kikuyu), and *Setaria* spp. (Pigeon Grass) likely introduced in the scope of pasture improvement for cattle grazing. Other non-native species present include *Senecio madagascariensis* (Fireweed), *Hypochaeris radicata* (Catsear), *Trifolium repens* (White Clover), *Paspalum spp.* and *Lysimachia arvensis* (Scarlet Pimpernel).

In cleared areas, *Cynodon dactylon* (Couch) is co-dominant with *C. clandestinus*. Although native, this species is considered non-endemic and potentially invasive in locations east of the Great Dividing Range in NSW.

The remaining 2.62ha in the Subject Site consists of patches of native ecotone consisting of immature trees, with native shrubs and trees. These patches have various numbers of non-native species including *Senna pendula* (Cassia), *Lantana camara* (Lantana), *Asparagus aethiopicus* (Ground Asparagus), *Rubus anglocandicans* (Blackberry), *Ochna serrulata* (Mickey Mouse Plant), *Sida rhombifolia* (Paddy's Lucerne), *Conyza sumatrensis* (Fleabane) *and Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush).

C. monilifera, S. madagascariensis and *A. aethiopicus* are noted as priority weeds for the Hunter (NSW DPI). The control of these and other weeds in construction activities and rehabilitation areas is scheduled in the VMP.

3.0 Threatened Fauna Species and Populations Impacts

3.1 Habitat for Native Fauna

While the Subject Site would offer marginal habitat for some mobile threatened species, the quality thereof is impacted by residential and commercial development in adjoining lands to the east and north. The Subject Site has no hollow-bearing trees (HBTs) and few mature eucalypts.

Full assessment of impacts against threatened species is provided in the BDAR (AEP 2022).

3.2 Threatened Species and Populations

Table 5 - Threatened Fauna Considerations

Species	Likelihood of Impact on Wildlife Corridor
Bush Stone-curlew *Burhinus grallarius*	The species has a strong preference for habitats with extensive fallen/standing dead timber including logs of which there is little in the Subject Site. While habitat would be removed by the Proposal, habitat in retained adjoining lands would be improved under the VMP.
Eastern Pygmy-possum *Cercartetus nanus*	The species has a strong preference for habitats with extensive fallen/standing dead timber including logs of which there is little in the Subject Site. While some marginal habitat would be removed by the Proposal, habitat in retained adjoining lands would be improved under the VMP.
Wallum Froglet *Crinia tinnula*	The species has a strong preference for habitats with extensive fallen/standing dead timber including logs of which there is little in the Subject Site. While some marginal habitat would be removed by the Proposal, habitat in retained adjoining lands would be improved under the VMP.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	No mature trees for nesting, or foraging habitat impacted. Unlikely to be impacted by the Proposal.
Little Eagle *Hieraaetus morphnoides*	No mature trees for nesting. Marginal foraging habitat impacted. Better habitat in retained adjoining vegetation. Unlikely to be impacted by the Proposal.
Pale-headed Snake *Hoplocephalus bitorquatus*	No habitat impacted. Unlikely to be impacted by the Proposal.
Green and Golden Bell Frog *Litoria aurea*	While some marginal habitat would be removed by the Proposal, habitat in retained adjoining lands would be improved under the VMP.
Green-thighed Frog *Litoria brevipalmata*	While some marginal habitat would be removed by the Proposal, habitat in retained adjoining lands would be improved under the VMP.
Square-tailed Kite *Lophoictinia isura*	No mature trees for nesting. Marginal foraging habitat impacted. Better habitat in retained adjoining vegetation. Unlikely to be impacted by the Proposal.
Giant Barred Frog *Mixophyes iteratus*	No roosting / nesting habitat in Subject Site. Marginal foraging habitat impacted. Better habitat in retained adjoining vegetation. Unlikely to be seriously impacted by the Proposal.
Southern Myotis *Myotis macropus*	No HBTs impacted. Foraging habitat (two dams) impacted. Unlikely to be seriously impacted by the Proposal.
Eastern Osprey *Pandion cristatus*	No mature trees for nesting. Marginal foraging habitat impacted. Better habitat in retained adjoining vegetation. Unlikely to be impacted by the Proposal.
Giant Dragonfly *Petalura gigantea*	Foraging habitat (two dams) impacted. Unlikely to be seriously impacted by the Proposal
Squirrel Glider *Petaurus norfolcensis*	No HBTs impacted. Marginal foraging habitat impacted. Unlikely to be seriously impacted by the Proposal.

Species	Likelihood of Impact on Wildlife Corridor
Brush-tailed Phascogale *Phascogale tapoatafa*	No HBTs impacted. Marginal foraging habitat impacted. Unlikely to be seriously impacted by the Proposal
Koala *Phascolarctos cinereus*	Marginal foraging habitat impacted. Development footprint adjoins residential lots, so unlikely to be seriously impacted by the Proposal.
Common Planigale *Planigale maculata*	Inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks.
Grey-headed Flying-fox *Pteropus poliocephalus*	Marginal foraging habitat impacted. Highly mobile, it is unlikely to be seriously impacted by the Proposal.
Red-backed Button-quail *Turnix maculosus*	Marginal foraging habitat impacted. It is unlikely to be seriously impacted by the Proposal.
Mahony's Toadlet *Uperoleia mahonyi*	Marginal habitat impacted. Better habitat in retained adjoining vegetation. Unlikely to be impacted by the Proposal.

4.0 Mitigation of Impacts on the Wildlife Corridor

4.1 Project Design - Avoidance Measures

The Subject Site has been mostly sited within R2 zoned land, which coincides with the lowest quality native vegetation and the majority of non-native non-native grassland in the Parent Lot. Indirect impacts may occur to the west of the development footprint and these have conservatively been included within the total Subject Site. Presence of large areas of less-disturbed remnant vegetation to the west demonstrates continued habitat connectivity that is not incompatible with the proposed development footprint at the Subject Site. The retained vegetation in the Parent Lot is also contiguous with other mapped WCC land (see **Figure 3**).

While all trees within the development footprint are likely to be removed, detailed design has largely avoided mature trees with potential for roosting and nesting habitat for arboreal fauna, which occur to the west of the Subject Site.

4.2 Biodiversity Management Plan

Avoid and minimise principles have been considered and implemented throughout the assessment and design process, and the latest iteration of the proposed development plan has sought to restrict development to R2 zoned lands, with retained drainage lines being rehabilitated under an approved VMP.

The focus of the VMP land is to protect retained lands and manage native fauna welfare issues against construction impacts. The VMP considers:

- Weed management and habitat and corridor supplementary tree planting in retained lands (**Figure 4**);
- The use of locally occurring and grown native species suitable for the vegetation community being replanted; and
- Mitigation management of native fauna welfare against impacts from clearing and construction works.

The VMP details the appointment of a Project Ecologist (the PE) prior to commencement of construction. The PE will be responsible for adherence to methods scheduled in the VMP.

4.3 Clearing Works

The PE will conduct pre-clearance works to ensure the ecological structural integrity of retained lands and native fauna welfare are protected during clearing works.

Measures are fully scheduled in the VMP.

4.4 Fencing and Tracks

Temporary fencing will be utilised in construction to prevent machinery access to retained lands.

On completion of construction permanent rural-style fencing of post and rail construction will be erected to prevent machinery and limit public access but to allow for movement of fauna. Barbed wire is NOT to be used anywhere in the Subject Site.

Signage will be installed along fencing to advise residents of the need to protect retained lands

The PE will conduct survey to ensure the fully scheduled measures in the VMP are maintained during clearing works and final fencing and signage is installed.

4.5 Water Quality and Hydrology

An Erosion and Sedimentation Control Plan (ESCP) should be prepared for the Proposal following guidelines from *Landcom* (2004) and best practice measures implemented for the construction phase. Measures should be checked weekly and especially after rain events.

Under the VMP, retained riparian zones would be rehabilitated, improving quality of stormwater and runoff and providing habitat for native species.

AEP

Figure 4 - Management Zones

Date: August 2022

Location: Lot 23 Boomerang Dr, Blueys Beach

Client: Addenbrooke Pty Ltd

AEP ref: 2506.05

5.0 Bushfire Protection in the Wildlife Corridor

5.1 Section 88 Covenants

Legal mechanisms, such as Community Title subdivision or s88B or s88E covenants/restrictions under the Conveyancing Act are to be put in place to prevent the following activities within the recognised wildlife corridors and core habitat areas. Such measures would be scheduled in the Bushfire Threat Assessment for the Proposal.

Asset Protection Zones (APZ) are to function as transitional zones and buffers between development and recognised wildlife corridors and core habitat areas. As such, APZs shall be managed to meet the APZ formation and management requirements of *Planning for Bushfire Protection (PBP 2019)*. APZs are scheduled in **Figure 5**.

Within the APZ, removal of native trees shall be minimised. Tree removal for APZ purposes shall be designed to achieve preferential retention of important trees for fauna. Prior to construction, the PE will survey and clearly mark trees for retention.

5.2 No Timber Removal

While the WCC specifies no timber is to be removed from APZs, PBP 2019 requires the reduction of combustible material in the ground layer. As such, fallen timber would be relocated into adjacent, upslope conservation lands to facilitate habitat for terrestrial fauna.

5.3 Retention of Valuable Habitat Trees in APZs

Within the APZ, removal of native trees shall be minimised. Tree removal for APZ purposes shall be designed to achieve preferential retention of the more important habitat tree species and features (such as Koala food trees, Glossy-black Cockatoo food trees, HBTs, old-growth trees and nectar trees).

5.4 Groundcover Management

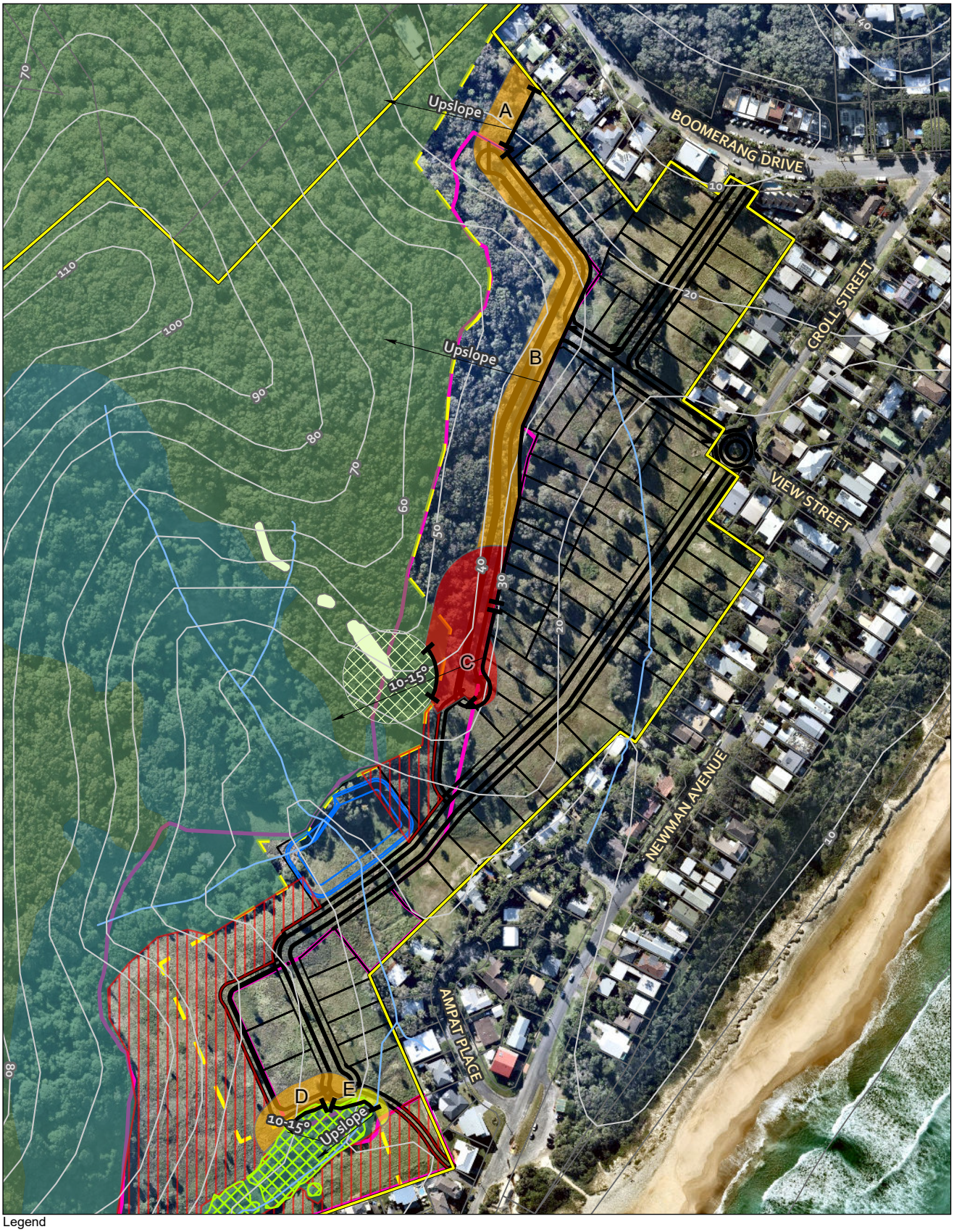
Regular reduction and suppression of groundcover vegetation in the APZ shall be conducted in a manner that protects retained tree cover while keeping understorey species <100mm height.

Other measures to protect the integrity of the Wildlife Corridor within APZs include:

- Rubbish is not to be allowed to accumulate;
- No stockpiling nor storage of any materials;
- Removal of soil or rocks;
- Introduction of foreign materials; and
- Clearing of native vegetation except to meet APZ standards in PBP 2019.

5.5 Define Limits of APZ

Fencing between limits of APZ and Conservation Lands will be installed and APZ limits shall be clearly identified on the land and maintained in accordance with the PBP 2019 for the life of the development.



Legend

- Contour - 10m
- Watercourse
- Development Area
- Subject Land
- Cadastre
- C2 / C4 Zone Boundary

Vegetation Formation

- Forest
- Rainforest

Asset Protection Zone (APZ)

- Asset Protection Zone - 9m
- Asset Protection Zone - 20m
- Asset Protection Zone - 39m
- C4 APZ

Ecological Constraints

- 2506 Rhodamnia
- EXCLUSION ZONE 2506 Rhodamnia
- PCT 1525

N

DKGIS

Date: 23/08/2022

0 25 50 100

Metres

Figure 5: Asset Protection Zone (APZ)

Coordinate System: GDA 1994 MGA Zone 56

Imagery: © Nearmap

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6.0 Conclusion

The Subject Site has no hollow-bearing trees, caves, rocky outcrops, or flyways, and the non-native grassland with small patches of native vegetation would provide little to no habitat for native flora and fauna. It has been determined suitable for the Subject Site to be developed.

The proposal will require the total removal of vegetation within the development footprint. Required offsets under the BC Act have been determined and scheduled in the BDAR (AEP, 2022).

In Asset Protection Zones, habitat trees for threatened fauna would be preferentially retained. Retained vegetation areas within the development will be rehabilitated under the Biodiversity Management Plan for the Proposal and will provide improved habitat for native flora and fauna.

Detail design of the development has limited impacts to the Wildlife Corridor to the more disturbed and less connected eastern side of the Subject Site and mitigation against native fauna issues during clearing has been addressed in the Biodiversity Management Plan.

The above demonstrates the minimisation and mitigation of impacts upon the Wildlife Corridor has been suitably addressed.

7.0 References

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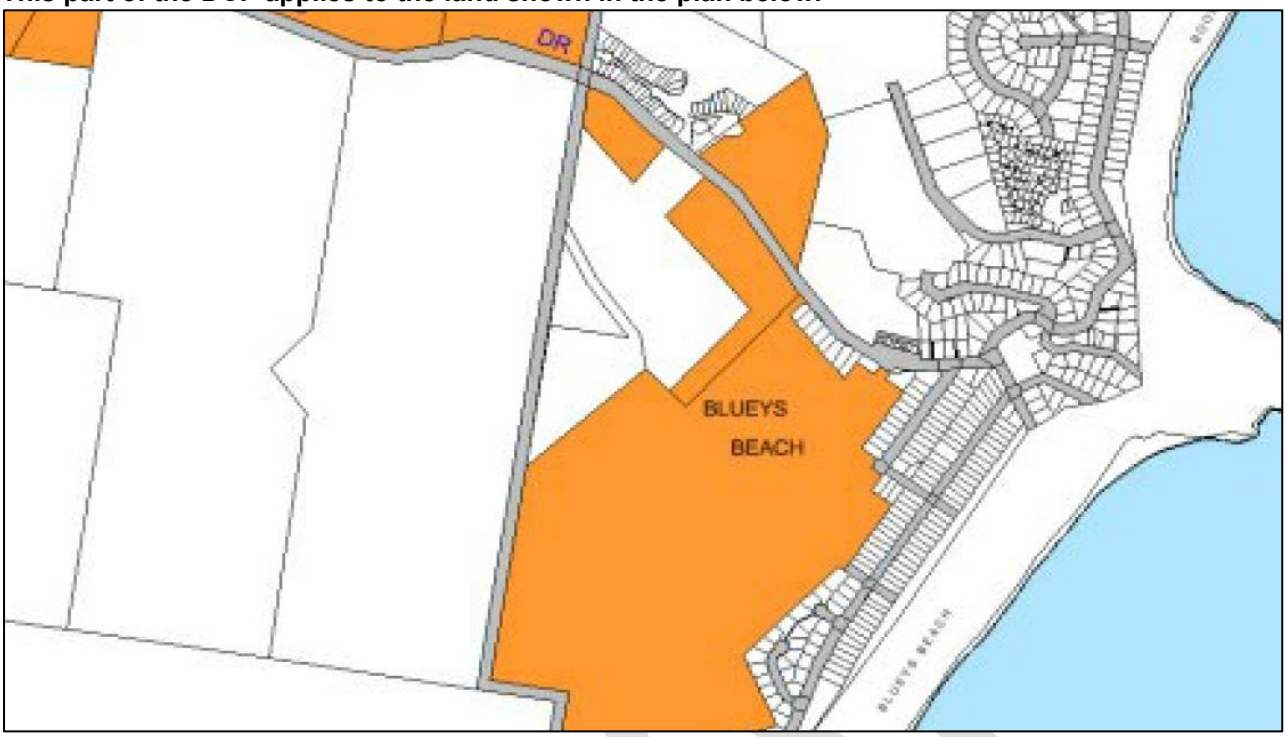
Appendix A – Compliance with Mid Coast Council Controls for Wildlife Corridors

Scheduled WCMP Lands – Lot 23 Blueys Beach NSW

Compliance with Great Lakes DCP Ch 16, p 187-188 s.16.22.1.3 Specific Controls for Wildlife Corridors

https://www.midcoast.nsw.gov.au/Plan-Build/Stage-2-Rules-and-Regulations/Planning-Rules

This part of the DCP applies to the land shown in the plan below.



Pacific Palms Properties affected by wildlife corridor controls include the Subject Site

Specific Controls for Wildlife Corridors

Objectives: To ensure that critical fauna movement corridors at Pacific Palms are protected and effectively managed

Control	Measure	WCMP Section
1	A Wildlife Corridor Management Plan (WCMP) is to be submitted for Council approval with the development application for the land. The WCMP is to:	This WCMP
	a) Identify native vegetation communities, the habitats of native fauna (including threatened species, endangered populations and endangered ecological communities), so as to accurately define the fauna movement corridor on the land;	**2**
	b) Nominate on a plan all trees that are proposed to be removed. For all trees nominated for removal the habitat value and degree to which each tree contributes to a fauna movement corridor is to be assessed;	**Figure 4**
	c) Identify the fauna that would use the fauna corridor;	**3**
	d) Identify the potential impacts of the development of the land upon the habitats and fauna movement corridor;	**Table 5**
	e) Having regard to items a) – d) above, nominate actions to mitigate the impacts of the development upon the corridor including restoration, reinstatement or rehabilitation. Other actions may include placement of nesting boxes, refuge poles, hollows, logs, rocks or other habitat elements. A detailed plan detailing the actions shall be included with the WCMP;	**4**
	f) Identify adequate and appropriate bushfire regimes with respect to bushfire intervals and thresholds;	**5**
	g) Indicate the location and style of interpretive signage to inform residents of the importance and location of the corridor/s;	**4.4**

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Control	Measure	WCMP Section
	h) Identify the density and diversity of exotic flora species and the control and management of noxious weeds, weeds of national significance and environmental weeds;	**2.3**
	i) Identify any proposed and required tracks, trails and/ or fencing on the land and the means of establishing and maintaining such; and	**4.4**
	j) Identify the means with which human access into retained native vegetation is to be managed and controlled.	**4.4**
2	Legal mechanisms, such as Community Title subdivision or s88B or s88E covenants/restrictions under the Conveyancing Act are to be put in place to prevent the following activities within the recognised wildlife corridors and core habitat areas;	**5.1**
	a) the planting or introduction of non-local or non-native plant species;	**4.2**
	b) clearing of native vegetation;	**4**
	c) the degradation of the natural state of flow, supply, quantity, or quality of water;	**4**
	d) the removal from, the introduction or disturbance of any soil or rocks or the construction of new dams;	**4**
	e) the accumulation of rubbish or the storage of any materials; and	**4**
	f) the removal of any timber including fallen timber.	**5.2**
3	Asset Protection Zones (APZ) are to function as transitional zones and buffers between development and recognised wildlife corridors and core habitat areas. In this regard, such areas shall be managed to meet the APZ formation and management requirements of the NSW Rural Fire Service document 'Planning for Bush Fire Protection 2006' or its successor. The width of APZs is to be reduced as much as possible by increasing the level of construction of dwellings under AS 3959 2009. Specifically:	**5**
	a) The removal of native trees shall be minimised. Tree removal for APZ purposes shall be designed to achieve preferential retention of the more important habitat tree species and features (such as koala food trees, glossy black cockatoo food trees, hollow-bearing trees, old-growth trees, special nectar trees). Pruning shall be utilised to avoid direct removal, wherever possible and particularly for any hollow-bearing trees that are of reduced safe useful life expectancy but which can be managed to assist their retention and longevity, i.e. selective canopy reduction in accordance with arboriculture standards; b) Reduction and suppression of the groundcover vegetation in the APZ shall be conducted in a manner that protects retained tree cover and sensitively protects rocks, logs and other features of significance for fauna, protecting and retaining clumps of native groundcover vegetation where possible; and c) APZ limits shall be clearly identified on the land and maintained in accordance with the approved Bush Fire Assessment Level.	**4-5**

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Appendix B – Flora Species List

Compiled from AEP Surveys 2021-2022

Family	*Scientific Name*	Common Name
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower
Acanthaceae	*Brunoniella australis*	Blue Trumpet
Adiantaceae	*Adiantum hispidulum*	Rough Maidenhair
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed
Apiaceae	*Centella asiatica*	Swamp Pennywort
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
Apiaceae	*Hydrocotyle tripartita*	Pennywort
Apocynaceae	*Gomphocarpus fruiticosus**	Narrow Leaf Cotton Bush
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Araceae	*Gymnostachys anceps*	Settlers Flax
Araliaceae	*Polyscias sambucifolia*	Elderberry Panax
Araliaceae	*Astrotricha latifolia*	Broad-leaf Star-hair
Araliaceae	*Polyscias elegans*	Celery Wood
Araliaceae	*Heptapleurum actinophyllum**	Umbrella Tree
Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Arecaceae	*Archontophoenix cunninghamiana*	Bangalow Palm
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Asparagaceae	*Liriope sp.**	
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Conyza sp.**	A Fleabane
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Ageratina adenophora**	Crofton Weed
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata**	Bitou Bush
Asteraceae	*Euchiton sp.*	A Cudweed
Asteraceae	*Sonchus oleraceus**	Common Sow-thistle
Asteraceae	*Taraxacum officinale**	Dandelion
Asteraceae	*Euchiton sphaericus*	
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed
Asteraceae	*Ageratum houstonianum**	Blue Billy Goat Weed
Asteraceae	*Conyza sumatrensis**	Tall Fleabane
Asteraceae	*Cyanthillium cinereum var. cinereum**	Purple Fleabane
Bignoniaceae	*Pandorea pandorana*	Wonga Vine
Blechnaceae	*Doodia aspera*	Prickly Rasp Fern
Blechnaceae	*Blechnum sp.*	
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew
Commelinaceae	*Pollia crispata*	Pollia
Convolvulaceae	*Dichondra repens*	Kidney Weed
Convolvulaceae	*Polymeria calycina*	Bindweed
Cunoniaceae	*Ceratopetalum gummiferum*	NSW Christmas Bush
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Cyperaceae	*Gahnia aspera*	Saw Sedge
Cyperaceae	*Cyperus sesquiflorus**	
Cyperaceae	*Cyperus polystachyos*	
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Cyperaceae	*Eleocharis sphacelata*	Tall Spike-rush
Cyperaceae	*Schoenoplectiella mucronata*	River Clubrush
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-rush
Cyperaceae	*Carex appressa*	Tall Sedge
Cyperaceae	*Gahnia melanocarpa*	Black-fruit Saw-sedge
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dennstaedtiaceae	*Histiopteris incisa*	Bat's Wing Fern
Dennstaedtiaceae	*Hypolepis muelleri*	Harsh Ground Fern
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Dilleniaceae	*Hibbertia dentata*	Twining Guinea Flower
Dioscoreaceae	*Dioscorea transversa*	Native Yam
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash

Family	*Scientific Name*	Common Name
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart
Fabaceae	*Senna pendula var. glabrata**	
Fabaceae	*Acacia longifolia*	
Fabaceae	*Trifolium repens**	White Clover
Fabaceae	*Acacia elongata*	Swamp Wattle
Fabaceae	*Grona varians*	Slender Tick-trefoil
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea
Fabaceae	*Glycine tabacina*	Twining Glycine
Fabaceae	*Acacia longifolia var. longifolia*	Sydney Golden Wattle
Fabaceae	*Glycine clandestina*	Twining Glycine
Fabaceae	*Hardenbergia violacea*	False Sarsparilla
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil
Fabaceae	*Acacia longifolia var. sophorae*	Coastal Wattle
Flacourtiaceae	*Scolopia braunii*	Flintwood
Goodeniaceae	*Goodenia stelligera*	Spiked Goodenia
Haloragaceae	*Gonocarpus teucrioides*	Raspwort
Iridaceae	*Sisyrinchium iridifolium**	Blue Pigroot
Juncaceae	*Juncus bufonius*	Toad Rush
Juncaceae	*Juncus usitatus*	Common Rush
Juncaceae	*Juncus planifolius*	Broad Rush
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower
Lauraceae	*Neolitsea australiensis*	Green Bolly Gum
Lauraceae	*Neolitsea dealbata*	White Bolly Gum, Hairy-leaved Bolly Gum
Lobeliaceae	*Lobelia purpurascens*	Whiteroot
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush
Loranthaceae	*Dendrophthoe vitellina*	Mistletoe
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
Lycopodiaceae	*Lycopodium sp.*	
Malaceae	*Rhaphiolepis indica**	Indian Hawthorn
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Meliaceae	*Synoum glandulosum subsp. glandulosum*	Scentless Rosewood
Menispermaceae	*Stephania japonica*	Snake vine
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine
Menyanthaceae	*Nymphaea caerulea subsp. zanzibarensis**	Cape Waterlily
Monimiaceae	*Wilkiea huegeliana*	Wilkiea, Veiny Wilkiea
Monimiaceae	*Daphnandra apatela*	
Moraceae	*Streblus brunonianus*	Whalebone Tree
Moraceae	*Ficus coronata*	Sandpaper Fig
Moraceae	*Ficus fraseri*	Sandpaper Fig
Moraceae	*Ficus microcarpa**	Hill's Weeping Fig
Moraceae	*Ficus obliqua*	Small-leaved Fig
Moraceae	*Ficus sp.**	
Myrsinaceae	*Myrsine variabilis*	Muttonwood
Myrtaceae	*Syzygium oleosum*	Blue lillypilly
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Eucalyptus siderophloia*	Northern Grey Ironbark
Myrtaceae	***Rhodamnia rubescens***	**Scrub Turpentine**
Myrtaceae	*Lophostemon confertus*	Brush Box
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush
Myrtaceae	*Melaleuca ericifolia*	Swamp Paperbark
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum
Myrtaceae	*Eucalyptus canaliculata*	Large Fruited Grey Gum
Myrtaceae	*Eucalyptus propinqua*	Small Fruited Grey Gum

Family	*Scientific Name*	Common Name
Myrtaceae	*Baloghia inophylla*	Brush Bloodwood
Myrtaceae	*Eucalyptus microcorys*	Tallowwood
Myrtaceae	*Austromyrtus dulcis*	Midgen Berry
Myrtaceae	*Callistemon linearis*	Narrow-leaved Bottlebrush
Ochnaceae	*Ochna serrulata**	Mickey Mouse Plant
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive
Oleaceae	*Notelaea ovata*	Mock Olive
Oleaceae	*Notelaea sp.*	
Orchidaceae	*Cymbidium suave*	Snake Orchid
Orchidaceae	*Epidendrum sp.**	
Orchidaceae	*Spiranthes australis*	Ladies' Tresses
Oxalidaceae	*Oxalis perrenans*	Yellow-flowered Wood Sorrel
Passifloraceae	*Passiflora caerulea**	Passionfruit
Passifloraceae	*Passiflora herbertiana*	Native Passionfruit
Philydraceae	*Philydrum lanuginosum*	Woolly Frogmouth
Phormiaceae	*Dianella caerulea var. producta*	Blue Flax Lily
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree
Phyllanthaceae	*Glochidion ferdinandii*	Cheese Tree
Phyllanthaceae	*Phyllanthus hirtellus*	Thyme Spurge
Phyllanthaceae	*Poranthera microphylla*	Small Poranthera
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry
Plantaginaceae	*Veronica plebeia*	Creeping Speedwell
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Oplismenus aemulus*	Basket Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Cenchrus clandestinum**	Kikuyu
Poaceae	*Setaria sp.**	
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Entolasia marginata*	Bordered Panic
Poaceae	*Oplismenus imbecillis*	
Poaceae	*Paspalum mandiocanum**	Broadleaf Paspalum
Poaceae	*Digitaria sanguinalis**	Crab Grass
Poaceae	*Echinopogon ovatus*	Forest Hedgehog Grass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Digitaria sp.**	A Finger Grass
Poaceae	*Paspalum orbiculare*	Ditch Millet
Poaceae	*Themeda triandra*	Kangaroo Grass
Poaceae	*Briza maxima**	Quaking Grass
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass
Poaceae	*Ehrharta erecta**	Panic Veldtgrass
Poaceae	*Echinopogon caespitosus var. caespitosus*	Tufted Hedgehog Grass
Poaceae	*Setaria sphacelata**	South African Pigeon Grass
Poaceae	*Chloris gayana**	Rhodes Grass
Poaceae	*Eragrostis sp.**	Lovegrass
Poaceae	*Poa labillardierei subsp. nervosa*	
Poaceae	*Poa labillardierei var. labillardierei*	Tussock Grass
Poaceae	*Rytidosperma sp.*	
Poaceae	*Chloris sp.**	
Poaceae	*Cymbopogon refractus*	Barbwire Grass
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Polygonaceae	*Rumex crispus**	Curled Dock
Polygonaceae	*Persicaria decipiens*	Slender Knotweed
Polygonaceae	*Persicaria subsessilis*	Hairy Knotweed
Polypodiaceae	*Platycerium bifurcatum*	Elkhorn

Family	*Scientific Name*	Common Name
Portulacaceae	*Portulaca oleracea*	Purslane
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel
Primulaceae	*Lysimachia arvensis var. caerulea**	Blue Pimpernel
Proteaceae	*Banksia integrifolia*	Coast Banksia
Pteridaceae	*Cheilanthes sieberi*	Rock Fern
Putranjivaceae	*Drypetes deplanchei*	Yellow Tulipwood
Ranunculaceae	*Clematis aristata*	Old Man's Beard
Ranunculaceae	*Ranunculus productus*	
Ranunculaceae	*Ranunculus inundatus*	River Buttercup
Rhamnaceae	*Pomaderris ferruginea*	Rusty Pomaderris
Rosaceae	*Rubus rosifolius*	Forest Bramble
Rosaceae	*Rubus moluccanus*	Broad-leaf Bramble
Rosaceae	*Rubus anglocandicans**	Blackberry
Rubiaceae	*Gynochthodes jasminoides*	Sweet Morinda
Rubiaceae	*Coprosma repens**	New Zealand Laurel
Rubiaceae	*Richardia humistrata**	
Rubiaceae	*Pomax umbellata*	Pomax
Rubiaceae	*Opercularia diphylla*	
Rubiaceae	*Psychotria loniceroides*	Hairy Psychotria
Rutaceae	*Melicope micrococca*	White Euodia, Hairy-leaved Doughwood
Santalaceae	*Exocarpos sp.*	
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Sapindaceae	*Diploglottis australis*	Native Tamarind
Sapindaceae	*Guioa semiglauca*	Guioa
Sapindaceae	*Alectryon subcinereus*	Native Quince
Sapotaceae	*Planchonella australis*	Black Apple
Smilacaceae	*Smilax australis*	Lawyer Vine
Smilacaceae	*Ripogonum album*	White Supplejack
Smilacaceae	*Smilax glyciphylla*	Sarsaparilla
Solanaceae	*Solanum chenopodioides**	Whitetip Nightshade
Solanaceae	*Solanum mauritianum**	Wild Tobacco
Sterculiaceae	*Commersonia fraseri*	Brush Kurrajong
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower
Typhaceae	*Typha orientalis*	Cumbungi
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Verbena sp.**	
Verbenaceae	*Verbena officinalis**	Common Verbena
Verbenaceae	*Verbena x brasiliensis**	Gin Case
Verbenaceae	*Verbena incompta**	
Violaceae	*Viola sp.*	
Violaceae	*Viola banksii*	
Violaceae	*Viola hederacea*	Ivy-leaved Violet
Vitaceae	*Cissus hypoglauca*	Water Vine
Vitaceae	*Cissus antarctica*	Kangaroo Vine
Vitaceae	*Cayratia clematidea*	Native Grape
Zamiaceae	*Macrozamia communis*	Burrawang
Zingiberaceae	*Alpinia caerulea*	Native Ginger

* Denotes non-native species

Threatened species in bold.

Appendix C – Expected Fauna Species

EXPECTED FAUNA SPECIES LIST

The following list includes fauna species that could be reasonably expected to occur on or over the Study Area at some point, given site attributes and location.

Observations are denoted by the method of observation following the BioNet Atlas convention of recording, Survey: Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB)

Bat Records - Observed (O), Definitely (D) Possible or within Species Group (P) Likely (L)

Remote Equipment - Anabat (A), Songmeter (SM), Camera Trap (CT), Nest (N)* - Introduced species

? - Unconfirmed record, anecdotal records, etc.

A - NSW Atlas of Wildlife record of threatened species for the site.

Additional notes are included as to whether equipment was used to obtain the observation.

Threatened species listed under the *Biodiversity Conservation Act 2016* (BC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are indicated in bold font.

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Amphibia			
Adelotus brevis	Tusked Frog		
Crinia signifera	Common Eastern Froglet	O, W	
Limnodynastes dumerilii	Eastern Banjo Frog		
Limnodynastes peronii	Brown-striped Frog	O, W	
Limnodynastes tasmaniensis	Spotted Grass Frog	O, W	
Litoria caerulea	Green Tree Frog		
Litoria dentata	Bleating Tree Frog		
Litoria fallax	Eastern Dwarf Tree Frog	O, W	
Litoria freycineti	Freycinet's Frog		
Litoria gracilenta	Dainty Green Tree Frog		
Litoria jervisiensis	Jervis Bay Tree Frog		
Litoria latopalmata	Broad-palmed Frog		
Litoria peronii	Peron's Tree Frog		
Litoria revelata	Revealed Frog		
Litoria tyleri	Tyler's Tree Frog		
Platyplectrum ornatum	Ornate Burrowing Frog		
Pseudophryne coriacea	Red-backed Toadlet		
Uperoleia fusca	Dusky Toadlet		
Uperoleia laevigata	Smooth Toadlet		
Aves			
Acanthiza lineata	Striated Thornbill		
Acanthiza nana	Yellow Thornbill		
Acanthiza pusilla	Brown Thornbill		
Acanthiza reguloides	Buff-rumped Thornbill		
Acanthorhynchus tenuirostris	Eastern Spinebill	O	
Accipiter cirrocephalus	Collared Sparrowhawk		
Accipiter fasciatus	Brown Goshawk		
Accipiter novaehollandiae	Grey Goshawk		
*Acridotheres tristis**	Common Myna		
Acrocephalus australis	Australian Reed-Warbler		
Aegotheles cristatus	Australian Owlet-nightjar		
Ailuroedus crassirostris	Green Catbird		
Alectura lathami	Australian Brush-turkey	O	CT
Alisterus scapularis	Australian King-Parrot		
Anas castanea	Chestnut Teal		
Anas gracilis	Grey Teal		
*Anas platyrhynchos**	Mallard		
Anas superciliosa	Pacific Black Duck		
Anhinga novaehollandiae	Australasian Darter		
Anthochaera carunculata	Red Wattlebird	O, W	CT, SM
Anthochaera chrysoptera	Little Wattlebird	O, W	SM
Aquila audax	Wedge-tailed Eagle	O	
Ardea intermedia	Intermediate Egret	O	
Ardea pacifica	White-necked Heron		
Artamus leucoryn	White-breasted Woodswallow		
Aviceda subcristata	Pacific Baza		
Aythya australis	Hardhead		
Bubulcus ibis	Cattle Egret		
Butorides striata	Striated Heron		
Cacatua galerita	Sulphur-crested Cockatoo		
Cacatua sanguinea	Little Corella		
Cacomantis flabelliformis	Fan-tailed Cuckoo	O	
Cacomantis variolosus	Brush Cuckoo		
Calidris melanotos	Pectoral Sandpiper		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Caligavis chrysops	Yellow-faced Honeyeater	O	
Casmerodius modesta	Eastern Great Egret		
Centropus phasianinus	Pheasant Coucal	O, W	CT, SM
Ceyx azureus	Azure Kingfisher	O	
Chalcites basalis	Horsfield's Bronze-Cuckoo		
Chalcites lucidus	Shining Bronze-Cuckoo		
Chalcophaps indica	Emerald Dove		
Charadrius bicinctus	Double-banded Plover		
Charadrius ruficapillus	Red-capped Plover		
Chelodina longicollis	Eastern Snake-necked Turtle		
Chenonetta jubata	Australian Wood Duck		
Cincloramphus timoriensis	Tawny Grassbird		
Circus approximans	Swamp Harrier		
Cisticola exilis	Golden-headed Cisticola		
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)		
Colluricincla harmonica	Grey Shrike-thrush		
Columba leucomela	White-headed Pigeon	O	
*Columba livia**	Rock Dove		
Coracina novaehollandiae	Black-faced Cuckoo-shrike	O	
Coracina papuensis	White-bellied Cuckoo-shrike		
Corcorax melanorhamphos	White-winged Chough		
Cormobates leucophaea	White-throated Treecreeper		
Corvus coronoides	Australian Raven	O, W	CT, SM
Corvus orru	Torresian Crow		
Corvus tasmanicus	Forest Raven		
Cracticus nigrogularis	Pied Butcherbird	O, W	CT, SM
Cracticus torquatus	Grey Butcherbird	W	SM
Dacelo novaeguineae	Laughing Kookaburra	O, W	CT, SM
Dicaeum hirundinaceum	Mistletoebird		
Dicrurus bracteatus	Spangled Drongo	O	
Edolisoma tenuirostris	Cicadabird		
Egretta garzetta	Little Egret		
Egretta novaehollandiae	White-faced Heron		
Egretta sacra	Eastern Reef Egret		
Elanus axillaris	Black-shouldered Kite		
Entomyzon cyanotis	Blue-faced Honeyeater	O	
Eolophus roseicapilla	Galah	W	SM
Eopsaltria australis	Eastern Yellow Robin	O	CT
Ephippiorhynchus asiaticus	Black-necked Stork		
Eudynamys orientalis	Eastern Koel	O, W	SM
Eurostopodus mystacalis	White-throated Nightjar		
Eurystomus orientalis	Dollarbird	O	
Falco berigora	Brown Falcon		
Falco cenchroides cenchroides	Nankeen Kestrel		
Falco longipennis	Australian Hobby		
Falco peregrinus	Peregrine Falcon		
Falcunculus frontatus frontatus	Eastern Shrike-tit		
Gallinula tenebrosa	Dusky Moorhen		
Geopelia humeralis	Bar-shouldered Dove		
Gerygone mouki	Brown Gerygone		
Gerygone olivacea	White-throated Gerygone		
Gliciphila melanops	Tawny-crowned Honeyeater		
Glossopsitta pusilla	Little Lorikeet	O	
Grallina cyanoleuca	Magpie-lark	O	
Gymnorhina tibicen	Australian Magpie	O, W	CT, SM

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Haliaeetus leucogaster	**White-bellied Sea-Eagle**	O	
Haliastur indus	Brahminy Kite		
Haliastur sphenurus	Whistling Kite		
Heteroscenes pallidus	Pallid Cuckoo		
Hieraaetus morphnoides	**Little Eagle**		
Hirundapus caudacutus	**White-throated Needletail**	O	
Hirundo neoxena	Welcome Swallow	O	
Hypotaenidia philippensis	Buff-banded Rail		
Leucosarcia melanoleuca	Wonga Pigeon	O	
Lophoictinia isura	Square-tailed Kite		
Lopholaimus antarcticus	Topknot Pigeon		
Macropygia phasianella	Brown Cuckoo-Dove		
Malurus cyaneus	Superb Fairy-wren	O	
Malurus lamberti	Variegated Fairy-wren		
Manorina melanocephala	Noisy Miner	O, W	SM
Meliphaga lewinii	Lewin's Honeyeater	O	CT
Melithreptus lunatus	White-naped Honeyeater		
Merops ornatus	Rainbow Bee-eater		
Microeca fascinans	Jacky Winter		
Monarcha melanopsis	Black-faced Monarch		
Morus serrator	Australasian Gannet		
Myiagra cyanoleuca	Satin Flycatcher		
Myiagra rubecula	Leaden Flycatcher		
Myzomela sanguinolenta	Scarlet Honeyeater		
Neochmia temporalis	Red-browed Finch	O	CT
Neosericornis citreogularis	Yellow-throated Scrubwren	O	CT
Ninox novaeseelandiae	Southern Boobook		
Nycticorax caledonicus	Nankeen Night Heron		
Ocyphaps lophotes	Crested Pigeon	O	CT
Oriolus sagittatus	Olive-backed Oriole	O	
Pachycephala pectoralis	Golden Whistler	O	
Pachycephala rufiventris	Rufous Whistler		
Pandion cristatus	Eastern Osprey		
Pardalotus punctatus	Spotted Pardalote		
Pelecanus conspicillatus	Australian Pelican		
Petrochelidon nigricans	Tree Martin		
Petroica boodang	Scarlet Robin		
Petroica rosea	Rose Robin		
Philemon citreogularis	Little Friarbird		
Philemon corniculatus	Noisy Friarbird	O	
Phylidonyris niger	White-cheeked Honeyeater	O	
Phylidonyris novaehollandiae	New Holland Honeyeater		
Platalea regia	Royal Spoonbill		
Platycercus elegans	Crimson Rosella		
Platycercus eximius	Eastern Rosella	O	
Podargus strigoides	Tawny Frogmouth		
Porphyrio porphyrio	Purple Swamphen		
Psophodes olivaceus	Eastern Whipbird	O	CT
Ptilinopus magnificus	Wompoo Fruit-Dove		
Ptilinopus superbus	**Superb Fruit-Dove**		
Ptilonorhynchus violaceus	Satin Bowerbird	O	CT
Ptilotula fusca	Fuscous Honeyeater		
Rhipidura albiscapa	Grey Fantail	O	
Rhipidura leucophrys	Willie Wagtail	O	
Rhipidura rufifrons	Rufous Fantail		
Scythrops novaehollandiae	Channel-billed Cuckoo		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Sericornis frontalis	White-browed Scrubwren	O	CT
Sericornis magnirostra	Large-billed Scrubwren		
Sericulus chrysocephalus	Regent Bowerbird		
Sphecotheres vieilloti	Australasian Figbird	O	
*Spilopelia chinensis**	Spotted Turtle-Dove		
Stipiturus malachurus	Southern Emu-wren		
Stizoptera bichenovii	Double-barred Finch		
Strepera graculina	Pied Currawong	O, W	SM
*Sturnus vulgaris**	Common Starling		
Synoicus ypsilophora	Brown Quail		
Tachybaptus novaehollandiae	Australasian Grebe		
Taeniopygia guttata	Zebra Finch		
Threskiornis moluccus	Australian White Ibis		
Threskiornis spinicollis	Straw-necked Ibis		
Todiramphus macleayii	Forest Kingfisher		
Todiramphus sanctus	Sacred Kingfisher		
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	W	SM
Trichoglossus haematodus	Rainbow Lorikeet	O	
Tyto javanica	Eastern Barn Owl		
Vanellus miles	Masked Lapwing	O,W	SM
Zanda funereus	Yellow-tailed Black-Cockatoo	W	
Zosterops lateralis	Silvereye		
Mammalia			
Acrobates pygmaeus	Feathertail Glider		
Antechinus flavipes	**Yellow-footed Antechinus**		
Antechinus mimetes	Mainland Dusky Antechinus		
Antechinus stuartii	Brown Antechinus	O	CT
Austronomus australis	White-striped Freetail-bat		
*Bos taurus**	European cattle		
*Canis familiaris**	Dog		
Canis lupus dingo	Dingo		
*Cervus timorensis**	Rusa Deer		
Chalinolobus gouldii	Gould's Wattled Bat	O	A
Chalinolobus morio	Chocolate Wattled Bat	O	A
Dasyurus maculatus	Spotted-tailed Quoll		
*Equus caballus**	Horse		
Falsistrellus tasmaniensis	Eastern False Pipistrelle	O	A
*Felis catus**	Cat		
Isoodon macrourus	Northern Brown Bandicoot	O	CT
*Lepus capensis occidentalis**	Hare		
Macropus giganteus	Eastern Grey Kangaroo	O	
Melomys burtoni	Grassland Melomys		
Micronomus norfolkensis	**Eastern Coastal Free-tailed Bat**	O	A
Miniopterus australis	**Little Bent-winged Bat**	O	A
Miniopterus orianae oceanensis	**Large Bent-winged Bat**		
Myotis macropus	**Large-footed Myotis**	P	
*Mus musculus**	House Mouse		
Notamacropus rufogriseus	Red-necked Wallaby	O	
Nyctophilus geoffroyi	Lesser Long-eared Bat	P	
Nyctophilus gouldi	Gould's Long-eared Bat	P	
Ozimops ridei	Eastern Free-tailed Bat	L	
Perameles nasuta	Long-nosed Bandicoot	O	CT
Petauroides volans	**Greater Glider**		
Petaurus australis	**Yellow-bellied Glider**		
Petaurus breviceps	Sugar Glider		
Pseudocheirus peregrinus	Common Ringtail Possum		

Scientific Name	Common Name	Surveyed Observations	Survey Equipment
Pseudomys gracilicaudatus	Eastern Chestnut Mouse		
Pteropus poliocephalus	**Grey-headed Flying-fox**	O	
Rattus fuscipes	Bush Rat		
Rattus lutreolus	Swamp Rat		
*Rattus rattus**	Black Rat	O	CT
Rhinolophus megaphyllus	Eastern Horseshoe-bat		
Scoteanax rueppellii	**Greater Broad-nosed Bat**	O	A
Scotorepens orion	Eastern Broad-nosed Bat	P	
Scotorepens sp 1	Central-eastern Broad-nosed Bat		
Sminthopsis murina	Common Dunnart		
Tachyglossus aculeatus	Short-beaked Echidna		
Thylogale thetis	Red-necked Pademelon		
Trichosurus caninus	Short-eared Possum		
Trichosurus vulpecula	Common Brushtail Possum	O	CT
Vespadelus darlingtoni	Large Forest Bat		
Vespadelus pumilus	Eastern Forest Bat	O	A
Vespadelus troughtoni	Eastern Cave Bat	P	
Vespadelus vulturnus	Little Forest Bat	P	
Vombatus ursinus	Bare-nosed Wombat		
*Vulpes vulpes**	Fox		
Wallabia bicolor	Swamp Wallaby	O	
Reptilia			
Acanthophis antarcticus	Common Death Adder		
Amphibolurus muricatus	Jacky Lizard		
Bellatorias major	Land Mullet		
Cacophis krefftii	Southern Dwarf Crowned Snake		
Cacophis squamulosus	Golden-crowned Snake		
Cryptophis nigrescens	Eastern Small-eyed Snake		
Cyclodomorphus gerrardii	Pink-tongued Lizard		
Demansia psammophis	Yellow-faced Whip Snake		
Dendrelaphis punctulatus	Common Tree Snake	O	
Hemiaspis signata	Black-bellied Swamp Snake		
Hoplocephalus stephensii	Stephens' Banded Snake	Bionet Record	
Intellagama lesueurii	Eastern Water Dragon		
Lampropholis delicata	Dark-flecked Garden Sunskink	O	
Lampropholis guichenoti	Pale-flecked Garden Sunskink		
Morelia spilota spilota	Diamond Python	O	
Pogona barbata	Bearded Dragon		
Pseudechis porphyriacus	Red-bellied Black Snake	O	
Pseudonaja textilis	Eastern Brown Snake		
Pygopus lepidopodus	Common Scaly-foot		
Saiphos equalis	Three-toed Skink		
Tiliqua scincoides	Eastern Blue-tongue		
Varanus varius	Lace Monitor	O	CT
Vermicella annulata	Bandy-bandy		

Appendix O - BDAR Checklist

Table 24 Minimum information requirements for the Biodiversity Development Assessment Report and the Biodiversity Certification Assessment Report – Stage 1: Biodiversity assessment.

Stage 1 Checklist

BAM Reference	Information	BDAR Section	Completed
Report			
Introduction - Chapters 2 and 3	Introduction to the biodiversity assessment including: • brief description of proposed development • identification of subject land boundary, including: operational footprint (if BDAR), construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR), land proposed for biodiversity certification (if BDAR) • general description of the subject land • sources of information used in the assessment, including reports and spatial data	1.1	Yes
	Sources of information used in the assessment, including reports and spatial data	1.1.6	Yes
	Identification of assessment method applied (i.e. linear or site-based)	1.1.3	Yes
Landscape - Section 3.1, 3.2 and Appendix E	General description of subject land topographic and hydrological setting, geology and soils	1.2.1	Yes
	Percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2).	1.2.2	Yes
	IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	1.2.3	Yes
	Rivers and streams classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	1.2.4	Yes
	Wetlands within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	1.2.4	Yes
	Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	1.2.4	Yes
	Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.)	1.2.4	Yes

	Areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(8-9.))	1.2.4	Yes
	Any additional landscape features identified in any SEARs for the proposal	1.2.4	Yes
	NSW (Mitchell) landscape on which the subject land occurs	1.2.3	Yes
Native vegetation, Chapter 4, Appendix A and Appendix H	Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	1.3 Figure 5	Yes
	Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	1.3 1.3.3 Table 4	Yes
	Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	1.3.1	Yes
	Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	1.3.2	Yes
	Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	N/A	N/A
	For each PCT within the subject land, describe: • vegetation class • extent (ha) within subject land • evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.)) • plant species relied upon for identification of the PCT and relative abundance of each species • if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.)) • estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.))	1.3.3	Yes
	Describe the vegetation integrity assessment of the subject land, including: • identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	1.3.4, 1.3.5, 1.3.2	Yes

	• assessment of patch size (as described in BAM Subsection 4.3.2) • survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.) • use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))		
	Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A): • identify the PCT or vegetation class for which local benchmark data will be applied • identify published sources of local benchmark data (if benchmarks obtained from published sources) • describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) • provide justification for use of local data rather than BioNet Vegetation Classification benchmark values • provide written confirmation from the decision-maker that they support the use of local benchmark data	N/A	N/A
Threatened Species, Chapter 5	Identify ecosystem credit species likely to occur on the subject land, including: • list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification for addition of any ecosystem credit species to the list	1.4.1	Yes
	Identify species credit species likely to occur on the subject land, including: • list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) • justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) • justification for addition of any species credit species to the list	1.4.2, Table 6	Yes

	From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))	1.4.5, Table 15	Yes
	Present the outcomes of species credit species assessments from: • threatened species survey (as described in BAM Section 5.2.4) • expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3)	1.4.5 Table 15	Yes
	Where survey has been undertaken include detailed information on: • survey method and effort, (as described in BAM Section 5.3) • justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published • timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys • survey personnel and relevant experience • describe any limitations to surveys and how these were addressed/overcome	1.4.3 Table 14	Yes
	Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: • justification of the use of an expert report • identify the expert, provide evidence of their expert credentials and Departmental approval of expert status • all requirements of Box 3 have been addressed in the expert report	N/A	N/A
	Where use of local data is proposed (BAM Subsection 1.4.2):	N/A	N/A

	identify relevant species identify data to be amended identify source of information for local data, e.g. published literature, additional survey data, etc. justify use of local data in preference to VIS Classification or TBDC data provide written confirmation from the decision-maker that they support the use of local data		
	Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: • the unit of measure for each species is documented for species assessed by area: • the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5) • a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied for species assessed by counts of individuals: • the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.)) • the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken • the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	1.4.6	Yes
Prescribed impacts - Chapter 6	Identify potential prescribed biodiversity impacts on threatened entities, including: • karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1) • occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) • corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) • water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4)	Table 17	Yes

	• protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5) • where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)		
	Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Table 17	Yes
	Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3)	Table 17	Yes
	Where the proposed development is for a wind farm: identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: • resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5) • provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.) • predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	N/A	N/A
Maps			
Introduction - Chapters 2 and 3	Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR)	Figure 1	Yes
Landscape - Section 3.1, 3.2 and Appendix E	Site Map Boundary of subject land Cadastre of subject land Landscape features identified in BAM Subsection 3.1.3	Figure 1 and Figure 2	Yes
	Location Map Digital aerial photography at 1:1,000 scale or finer Boundary of subject land	Figure 1 and Figure 2	Yes

	Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) Landscape features identified in BAM Subsection 3.1.3 Additional detail (e.g. local government area boundaries) relevant at this scale		
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or Location map include: • IBRA bioregions and subregions • rivers, streams and estuaries • wetlands and important wetlands • connectivity of different areas of habitat • karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features • areas of outstanding biodiversity value occurring on the subject land and assessment area • any additional landscape features identified in any SEARs for the proposal • NSW (Mitchell) landscape on which the subject land occurs	Figure 1 and Figure 2	Yes
Native vegetation, Chapter 4, Appendix A and Appendix H	Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 3, Figure 4	Yes
	Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4	Yes
	Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	Figure 4, Figure 5	Yes
	Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 4	Yes
	Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 2	Yes
Prescribed impacts Chapter 6	Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	N/A	
	Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	N/A	

Tables			
Native vegetation, Chapter 4, Appendix A and Appendix H	Table of current vegetation integrity scores for each vegetation zone within the site and including: • composition condition score • structure condition score • function condition score • presence of hollow bearing trees	Table 12	Yes
Threatened Species, Chapter 5	Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: • the ecosystem credit species removed from the list • the sensitivity to gain class of each species	Table 13	Yes
	Table detailing species credit species in accordance with BAM section 5.2 and identifying: • the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present • the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 14 and Table 15	Yes
	Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Table 15	Yes
Prescribed impacts Chapter 6	No table		
Data			
Landscape - Section 3.1, 3.2 and Appendix E	All report maps as separate jpeg files / Individual digital shape files of: • subject land boundary • assessment area (i.e. subject land and 1500 m buffer area) boundary • cadastral boundary of subject land • areas of native vegetation cover • landscape features	Attached files	Yes

Native vegetation, Chapter 4, Appendix A and Appendix H	All report maps as separate jpeg files • Plot field data (MS Excel format) • Plot field data sheets		Yes
	Digital shape files of: • PCT boundaries within subject land • TEC boundaries within subject land • vegetation zone boundaries within subject land • floristic vegetation survey and vegetation integrity plot locations		Yes
Threatened Species, Chapter 5	Digital shape files of suitable habitat identified for survey for each candidate species credit species		Yes
	Survey locations including GPS coordinates of any plots, transects, grids		Yes
	Digital shape files of each species polygon including GPS coordinates of located individuals		Yes
	Species polygon map in jpeg format		Yes
	Expert reports and any supporting data used to support conclusions of the expert report		N/A
	Field data sheets detailing survey information including prevailing conditions, date, time, equipment used, etc		Yes
Prescribed impacts Chapter 6	Digital shape files of prescribed impact feature locations Prescribed impact features map in jpeg format		Yes

Table 25 Minimum information requirements for the BDAR or BCAR – Stage 2: Impact assessment (biodiversity values)

Stage 2 Checklist

BAM Reference	Information	BDAR Section	Completed
Report			
Avoid and minimise impacts – Chapter 7	Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: • modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology • routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route • alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location • alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	2.1 2.2 2.3	Yes
	Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Subsections 7.1.2 and 7.2)	2.1 Table 16	Yes
	Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	2.1 Table 16	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	2.1, 2.4 Table 20	Yes
	Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): • description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal • documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications • reporting any limitations or assumptions, etc. made during the assessment • identification of the threatened entities and their habitat likely to be affected	2.1 Table 22	Yes

	Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including: assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: • karst, caves, crevices, cliffs, rocks and other features of geological significance • human-made structures • non-native vegetation • connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range • movement of threatened species that maintains their life cycle • water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities • assessment of the impacts of wind turbine strikes on protected animals • assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	2.2, Table 21	Yes
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5, including: • techniques, timing, frequency and responsibility • identify measures for which there is risk of failure • evaluate the risk and consequence of any residual impacts • document any adaptive management strategy proposed	2.1, 2.2, 2.3, Table 20-23	Yes
	Identification of measures for mitigating impacts related to: • displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) • indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) • mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	2.1, 2.2, 2.3, Table 20-23	Yes
	Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	2.1, 2.2, 2.3, Table 20-23	Yes
Impact Summary - Chapter 9	Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: • addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land	2.5.1	Yes

	• addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land • documenting assumptions made and/or limitations to information • documenting all sources of data, information, references used or consulted • clearly justifying why any criteria could not be addressed		
	Identification of impacts requiring offset in accordance with BAM Section 9.2	2.5.2	Yes
	Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	2.5.3	Yes
	Identification of areas not requiring assessment in accordance with BAM Section 9.3	2.5.4	Yes
Biodiversity credit report – Chapter 10	Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	Table 26, Appendix G	Yes
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Land-based conservation measures including (strategic biodiversity certification only): • identification of parcels subject to land-based conservation measures • identification of land-based conservation measures proposed for each parcel • supporting information to demonstrate suitability of land-based conservation measures (Appendix J) • credit score of land-based conservation measures (Appendix J)	N/A	
	Biodiversity certification strategy including: • land proposed for biodiversity certification • land proposed for biodiversity conservation • proposed conservation measures • legal mechanisms for securing delivery of proposed conservation measures • parties to the biodiversity certification and responsibilities, noting where biodiversity certification agreements are proposed • timing for delivery of conservation measures • funding sources for delivery of conservation measures • framework for monitoring, reporting or auditing implementation of conservation measures	N/A	
Maps			

Avoid and minimise impacts – Chapter 7	Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation	Appendix A	
	Maps demonstrating indirect impact zones where applicable	Appendix A	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	No Maps		
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	No Maps		
Impact Summary – Chapter 9	Map showing the extent of TECs at risk of an SAII within the subject land	Figure 6	Yes
	Map showing location of threatened species at risk of an SAII within the subject land	Figure 9	
	Map showing location of: • impacts requiring offset • impacts not requiring offset • areas not requiring assessment	Figure 11	Yes
Impact Summary - Chapter 10	No Maps		
Biodiversity credit report – Chapter 10	No Maps		
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Maps of parcels of land proposed for land-based conservation measures	N/A	
	Maps as per Appendix M as required in relation to any land-based conservation measures	N/A	
Tables			

Avoid and minimise impacts – Chapter 7	Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Tables 16 - 23	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 14	Yes
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Tables 16 - 23	Yes
Impact Summary - Chapter 9	No Tables		
Impact Summary - Chapter 10	Table of PCTs requiring offset and the number of ecosystem credits required	Table 26	Yes
	Table of threatened species requiring offset and the number of species credits required	Table 27	Yes
Biodiversity credit report – Chapter 10	Table of credit class and matching credit profile	Appendix G	
Biodiversity certification offsets and strategy (biodiversity certification only)	Tables as per Appendix M as required in relation to any land-based conservation measures	N/A	
	Table of credit scores for land-based conservation measures, including scores produced by BAM and weighting adjusted scores as per Appendix J	N/A	
Data			
Avoid and minimise impacts – Chapter 7	Digital shape files of: • final proposal footprint • direct and indirect impact zones Maps in jpeg format	Attached files	Yes

Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	No data.		
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	No Data		
Impact Summary - Chapter 9	Digital shape files of: • extent of TECs at risk of an SAII within the subject land • location of threatened species at risk of an SAII within the subject land • boundary of impacts requiring offset • boundary of impacts not requiring offset • boundary of areas not requiring assessment		Yes
	Maps in jpeg format		
Impact Summary - Chapter 10	Submitted proposal in the BAM Calculator		Yes
Biodiversity credit report – Chapter 10	BAM credit report in pdf format		Yes
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Digital shape files of parcels of land proposed for land-based conservation measures		N/A
	Maps in jpeg format		N/A

Appendix P – CVs

Frances O'Brien

Curriculum Vitae

Frances is a Senior Ecologist and Lead Botanist with Anderson Environment and Planning, being an Accredited Assessor with over 12 years-experience in environmental impact assessment, environmental education, conservation land management, bush regeneration, wildlife rescue and rehabilitation, environmental sustainability, and environmental law.

Qualifications

- Biodiversity Accredited Assessor Scheme no. 20013
- Master of Environmental Law (University of Sydney NSW)
- Graduate Diploma of Legal Practice (Australian National University ACT)
- Bachelor of Environment (Climate Science) with Bachelor of Laws (Macquarie University NSW)

Further Education & Training

- NSW Driver's Licence.
- First Aid in Remote Situations (HLTAID005)
- General Construction Induction Card (White Card)
- Advanced Plant Identification (University of New South Wales NSW)

Fields of Competence

- Biodiversity Assessment Method application
- Plant identification
- PCT determination
- Environmental legislation interpretation
- GIS

Relevant Employment History

2021 – Present	**Senior Ecologist / Lead Botanist** Anderson Environment & Planning, Newcastle
2021	**Senior Scientist – Ecology** Ecology Team, Sustainability, Ecology and Climate Change Division, SMEC, Newcastle
2018 - 2021	**Senior Ecologist** Anderson Environment & Planning, Newcastle
2014 - 2017	**Environmental Officer** Projects Team, Seventh-day Adventist Aged Care, Greater Sydney, Wahroonga

Professional Affiliations / Memberships

- Ecological Consultants Association of NSW member
- Australian Plants Society NSW member
- Hunter Intrepid Landcare – Group Coordinator
- Wahroonga Waterways Landcare - Group Coordinator for three years (past)
- Lane Cove National Park Bushcare volunteer (past)
- Ku-ring-gai Municipal Council Bushcare volunteer (past)

CRAIG ANDERSON
Curriculum Vitae

An environmental professional with over 25 years experience providing high level ecological services, advice, strategic direction and management for sectors such as land development, infrastructure, conservation, government, legal, mining & quarrying.

Personal Details

Full Name:	Craig John Anderson
Date of Birth:	5 November 1971
Postal Address:	PO Box 210, ADAMSTOWN NSW 2289
Email:	craig@andersonep.com.au
Phone Mobile:	0418 681 581

Qualifications

- Bachelor of Applied Science (Environmental Assessment & Management) University of Newcastle, New South Wales (1994).
- Completing a Graduate Diploma in Archaeological Heritage through University of New England (one subject to complete).

Licencing

- NSW Scientific Investigation Licence SL101313
- NSW Animal Research Authority
- NSW Accredited Biobanking Assessor No. 150
- NSW Biodiversity Accredited Assessor BAAS: 17002

Further Education & Training (select summary)

- Biobank and Biocertification Assessors Training Course / BAAS Fast-track Accreditation Course
- Animal Ethics Training (University of Newcastle / NSW DPI)
- RFS / PIA NSW Consulting Planners Bushfire Training
- Bush Regeneration Training
- OH&S Induction Training / Green Card
- NSW Driver's Licence: Car (Class "C"). Experienced 4WD operator.
- Occupational Health & Safety Training, including legal compliance requirements of Officers (Standard 11 & S1,S2,S3).
- + various other vocational environmental and computer based training sessions.

Fields of Special Competence

- Production and peer review of detailed environmental impact assessment documentation. Author and / or Manager of hundreds of ecological / environmental / bushfire / historical heritage / archaeological heritage / strategic & statutory planning documents over nearly 25 years of environmental work
- Biobanking & Biodiversity Offset Commissions – initial scoping and feasibility, BAM impact assessments and BDAR reporting, biobank calculations, Stewardship site creation
- Detailed ecological field survey, covering all aspects of terrestrial and aquatic flora and fauna
- Expert witness legal representation
- Ecological Management Planning, ranging from individual species to full ecosystem management
- Project Management and delivery of complex projects, including projects worth more than $100M
- Project Management (including areas outside environmental sphere)
- Environmental Due Diligence processes for both asset procurement and divestment
- Management and co-ordination of teams producing EIA documentation
- Identification of strategic approval pathways and key project risk evaluation and management
- Extensive experience in conflict resolution, impact mediation and outcome negotiation on large scale and contentious projects
- Environmental peer review and ecological compliance auditing
- Project advocacy and representation with all levels of stakeholders
- Detailed knowledge of land and infrastructure development processes

Professional Affiliations / Memberships (past / present)

- Hunter Bird Observers Club (HBOC). Current member of Records Appraisal Committee, previous elected Committee Member.
- Ecological Consultants Association of NSW (ECA). Current member. Involved in the initial formulation of the Association. Served two terms as an elected Councillor.
- Society for Growing Australian Plants (SGAP).
- Hunter Coal Environment Group (HCEG).
- NSW Minerals Council (NSWMC), including Executive Committee Meetings representation.
- Queensland Resources Council (QRC).
- Bird Observers Club of Australia (BOCA).
- Urban Development Institute of Australia (UDIA).
- Planning Institute of Australia (PIA).
- Australasian Bat Society (ABS).
- Frog and Tadpole Study Group (FATS).

- Society of Frogs and Reptiles (SOFAR).
- Hunter Heritage Network (HHN).

Employment History

2013-present	**Director / Principal Consultant** Anderson Environment & Planning, Environment & Planning Consultants, Newcastle
2012-present	**Director** Habitat Indoor / Outdoor Living, Furniture, Homewares & Design, Newcastle
2010-2012	**General Manager Sustainable Development** Cockatoo Coal Ltd, Coal Mining Company, Newcastle / Sydney / Brisbane
2009 – 2010	**Independent Environmental Expert** Donaldson Conservation Trust
2010	**Principal - Environment** RPS, Development Consultants, Newcastle
2006 – 2009	**Manager Environment Group** RPS HSO, Development Consultants, Newcastle (Company sold to UK listed Company RPS in Nov 2006)
2001 – 2006	**Manager Environment Group / Director** Harper Somers O'Sullivan, Development Consultants, Newcastle. (Company Director & shareholder as of July 2003)
2000 – 2001	**Senior Ecologist & NSW Projects Manager** Wildthing Environmental Consultants, Salt Ash.
1996 – 1999	**Ecologist** Wildthing Environmental Consultants, Salt Ash.
1995 – 1996	**Ecologist / Environmental Officer** Pulver Cooper & Blackley, Engineers & Surveyors, Newcastle.
1995	**Environmental Officer / Cadastral Survey Assistant** Kel Nagle Cooper & Associates, Golf Course Design & Construction Newcastle.

Darcy Kilvert

Curriculum Vitae

Darcy works with AEP in the role of Ecologist. He graduated with a Bachelor of Science majoring in Biology. Darcy has worked as a Bush Regenerator for over 5 years and undertaken numerous volunteering projects in the environmental sector. These experiences have given him experience in flora & fauna identification, surveying, reporting, mapping, and ecological restoration

Qualifications

- Bachelor of Science (Biology), The University of Newcastle, completed in September 2021

Further Education & Training

- Class C NSW Driver's Licence
- NSW Construction White Card
- Working at Heights
- Chemcert and EPA ground applicator licence
- Apply First Aid

Fields of Competence

- Flora & fauna surveying both terrestrial and aquatic
- Growing proficiency in botanical surveys
- Adept experience in operating 4x4 vehicles

Relevant Employment History

2021 – Present — **Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation. Expanding knowledge of field survey methodology, report writing, mapping and data manipulation.

2018 - 2021 — **Senior Field Supervisor**
Traditional Aussie Gardens, Newcastle

2015 - 2017 — **Field Worker**
Newcastle City Council, Newcastle

Dennis Neader

Curriculum Vitae

Dennis works with AEP in the role of senior ecologist. He is an experienced bird watcher and a regular participant in Hunter Bird Observers' Club (HBOC) Bird Surveys in the wider Hunter Valley. Dennis has previously had a varied career as an environmental scientist, contaminated land consultant and bush regenerator with local firms. His background in birdwatching, post-approval project management and bush regeneration, combined with his ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Bachelor of Science (Environmental Geoscience) University of Newcastle (2011).
- Graduate Diploma in Environmental Management University of Newcastle (2 subjects to complete) (2014).

Further Education & Training

- NSW Class HR Driver's Licence.
- Experienced 4WD operator.
- Current Senior First Aid.
- Occupational Health & Safety Training.
- High Risk NSW Elevated Work Platform, Dogging and Light Forklift Truck.
- Open Water PADI Dive Certificate.
- Non-Friable Asbestos Removal.
- Chainsaw Operation and Maintenance.

Fields of Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna.
- Avifauna surveys, including challenging wetland and bushland environs.
- Field transect survey for cryptic flora species.
- Field survey for terrestrial fauna species including bird and reptile survey, koala habitat and SAT assessment, microbat, mammal track, scat identification and herpetological survey.
- Spotlighting, call playback, and stagwatch for arboreal mammal species, including Forest Owls, Squirrel Glider and Koala.
- Trapping and translocation works with mammals, reptiles and amphibians.
- Remote trapping including SongMeter and camera trapping emplacement and analysis.
- Post-approval Project management including Fauna Welfare.
- Bush regeneration.
- Native plant ID and seed collection.

- Contaminated Land – Asbestos Identification and Removal.

Relevant Employment History

2016 – Present **Senior Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, rehabilitation, advices, strategy and representation.

2014 - 2016 **Environmental Scientist**
JM Environments, Newcastle

As an environmental scientist with JM Environments, I was responsible for ecological surveys and reporting, water and air quality monitoring, calibration and maintenance of monitoring equipment, contaminated land Phase 1, 2 and 3 assessments, Remediation Action Plan preparation and project management, development of safe work procedures and safety inspections on site. I was responsible for ensuring projects were completed on time and on budget whilst meeting clients' expectations and achieving quality assurance standards.

2010 - 2014 **Environmental Techincian**
AECOM, Newcastle

Landscape Function Analysis surveys and reporting, water quality monitoring air quality monitoring.

2010 – 2014 **Contract GIS Technician**
Geodata, Newcastle

Data entry and interpretation of cadastral survey information into GeoCadastre and MapInfo software.

2006 – 2010 **Coal Superintending**
ALS & SGS Newcastle

Coal sampling, superintending and testing, sampling and data entry. Accurate, timely product processing and data entry of coal quality and analysis.

Pre 2006 Rigging, crane dogman, including outages and construction at major mine and building sites, self-employed in print industry

Relevant Ecological Experience

- 2011 – Current Bird Surveys
- Hunter Bird Observers Club – Shorebirds, Earthcare Park, Grahastown Dam Monthly Surveys
- Avifauna Baseline Surveys on Broughton Island.
- CVA Newcastle and Trees in Newcastle – Bird surveys in Hunter Valley for *Hunter Valley Stepping Stones Project Great Eastern Ranges* 2014-2017.

- NPWS - Population survey Gould's Petrel Cabbage Tree Island Port Stephens.
- 2008 – Current Bush Regeneration, Plant ID and Seed Collection
- CVA Newcastle and Trees in Newcastle.
- Blueys Beach DuneCare – Mid Coast Council Bush Regeneration.
- 2010 Volunteer Coral Reef Research
- University of Newcastle - Lady Elliot Island Queensland.

Professional Affiliations / Memberships

- Hunter Bird Observers' Club
- Birdlife Australia.
- Society for Growing Australian Plants.
- Australian Assoc. of Bush Regenerators.

STEVIE KAY
Curriculum Vitae

Stevie works with AEP in the role of Ecologist. Whilst studying at the University of Newcastle he conducted ecological field studies as a requirement of his degree courses. Working for NSW Department of Primary Industries (NSW DPI) at Port Stephens Fisheries Institute he gained further experience in ecological field surveys as a field technician and project officer. He has experience in targeted fauna and flora surveys, Koala Spot Assessment Technique (SAT) surveys and tree surveys.

Qualifications

- Bachelor of Science (Marine Science), University of Newcastle (2003)

Further Education & Training

- Senior First Aid
- Class C NSW Drivers Licence
- Work at Heights
- 4WD Safe Driving
- Construction White Card

Fields of Competence

- Aquatic vegetation and fish survey
- Terrestrial fauna survey, including koala SAT surveys and spotlighting

Relevant Employment History

Feb 2020 – Current	**Ecologist**
	Anderson Environment & Planning, Newcastle
Nov 2016 – May 2017	**Observer**
	NSW DPI Fisheries
Jan 2002 – Feb 2009	**Technician/Project Officer**
	NSW DPI Fisheries
Sept 2010 – Feb 2020	**Facilitator**
	Pinnacle Team Events

Relevant Volunteer Experience

- Bush Regeneration Volunteer, Hunter Indigenous Plants
- Permaculture Design, various locations

WARWICK MUIR

Curriculum Vitae

Warwick works with AEP in the role of Ecologist. Whilst studying at the University of Newcastle, he conducted ecological field studies as a requirement of his degree courses, gaining experience in the field. He has also undertaken volunteering for higher-level students in field reporting to assist in completion of their studies.

Qualifications

- Bachelor of Science (Biology), University of Newcastle (2019)

Further Education & Training

- First Aid Certificate
- Class C NSW Drivers Licence
- Construction White Card

Ecological Field Experience

- Riparian vegetation study, including vegetation species and cover surveys, vegetation zone classification and biobanking assessment methods to assessment methods to assess for proposed restoration works.
- Avifauna survey and observation to complete an independently hypothesised animal behaviour investigation in situ.
- Forest and woodland investigations, including vegetation species and cover surveys, habitat appraisal and leaf litter invertebrate observation.
- Macro-bat spotlighting, flight, roost and forage habitat surveys to develop a suggested management strategy for the studied species.

Relevant Employment History

Feb 2020 – Current — **Ecologist**
Anderson Environment & Planning, Newcastle

Volunteer Experience

- Bush Regeneration Volunteer, Newcastle Landcare
- Field data collection for environmental Honours and PHD candidates in various locations.