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NEWCASTLE SYDNEY

Biodiversity Development Assessment Report

Proposed Commercial Retail Development at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848) NSW

Prepared for: Monteath and Powys

October 2023

AEP Ref: 3063

BOAMS Ref: 00036337/BAAS19076/22/00036338

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Document Control

Document Name	Biodiversity Development Assessment Report for Proposed Commercial Retail Development at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318
Project Number	3063
Client Name	Monteath and Powys
Accredited Assessor	Natalie Black (BAAS 19076)
AEP Project Team	Craig Anderson Ian Benson Natalie Black Simon Purcell Kelly Drysdale Bonni Yare Alissa Rogers Naomi Stackhouse Tim Mouton Brendon Young Warick Muir Matt Booker Ben Graham

Revision

Revision	Date	Authors	Reviewed	Approved
00	3 March 2023	Kelly Drysdale	Simon Purcell	Natalie Black
01	24 October 2023	Kelly Drysdale	Natalie Black	Natalie Black

Distribution

Revision	Date	Name	Organisation
00	3 March 2023	Jamie Graham & Isaac Conway	Monteath and Powys
01	24 October 2023	Jamie Graham & Isaac Conway	Monteath and Powys

EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by Monteath and Powys to undertake a Biodiversity Development Assessment Report (BDAR) over land identified at 42 Fullerton Cove Road, Fullerton Cove NSW 2318, located within the Port Stephens Government Area (LGA).

Monteath and Powys are proposing a commercial retail development which will be situated in a section of Lot 14 DP 258848 and has been recently rezoned with a band of Environmental Conservation (C2) land to the south and east of the Neighbourhood Centre (B1) of the commercial zoning. The concept site plan details a supermarket, retail stores, medical centre, carpark, which includes APZ's and associated infrastructure.

Kleinfelder were commissioned to undertake the BDAR for the subdivision and Planning Proposal as accepted by Port Stephens Council and those works formed the basis for AEP to complete a BDAR for the development and the assigned offsets.

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* . 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 Study Area covers approximately 6.86ha and the Subject Site zoned Neighbourhood Centre (B1) totals approx. 2.46ha, with the remainder of the land zoned Environmental Conservation (C2) totalling approximately 4.40ha. The Subject Site contains residential dwellings, sheds, semi-maintained gardens and previously cleared, slashed paddock areas and patches of remnant vegetation.

The native vegetation within the Subject Site (2.27ha) contains four (4) plant community types (PCTs), which are present in varying condition. Six (6) vegetation zones have been assessed within these PCTs:

- PCT 1646 – *Smoothbarked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* (Severely degraded) 1.42ha*;*
- PCT 1646 – *Smoothbarked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* (Moderate) 0.004ha (rounded to 0.01ha)*;*
- PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* (Poor/Managed) 0.11ha;
- PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* (Poor) 0.46ha. This community forms part of the Endangered Ecological Community (EEC) Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland;
- PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* (Moderate) 0.007ha This community forms part of the Endangered Ecological Community (EEC) Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. This small area of impact is considered to be commensurate with the state listed TEC and is associated with the proposed business signage located within C2 zoned land*.*
- PCT 1737 – *Typha rushland* (Moderate) 0.27ha. This community forms part of the Endangered Ecological Community (EEC) Freshwater wetlands on coastal floodplains of the NSW North Coast/Sydney Basin and South East corner bioregions.

While the site is highly degraded, given there are no condition thresholds set within final determination for the state listed TEC, PCT 1737 (Moderate) is considered to be commensurate with the EEC

Freshwater wetlands on coastal floodplains of the NSW North Coast/Sydney Basin and South East corner bioregions.

PCT 1717 (Poor) was considered to be commensurate with the State listed TEC; Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and is also considered be commensurate with EPBC listed TEC; Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland and met the condition thresholds for this community (addressed in **Appendix G**).

Due to the managed and isolated location of PCT 1717 (poor/managed), this PCT is not considered to be associated with the State or Commonwealth listed TECs.

The remainder of the Subject Site comprises of 0.19ha consists of current tracks and infrastructure in the form of existing residential infrastructure.

A further area within the C2 lands was investigated for ecological impacts for the location of signage pertaining to the commercial development with a 3m buffer impact area of 0.007ha.

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 following listed species have been recorded within the Subject Site, or have been assumed as present, and will generate Credits under the Biodiversity Offset Scheme, these species include;

- Southern Myotis (*Myotis macropus*);
- Common Planigale (*Planigale maculata*)

The surveys also resulted in other threatened species identified within the Subject Site that will be incorporated into Ecosystem Credits, which include;

- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*);
- Little Bent-winged Bat (*Miniopterus australis*); and
- Yellow-bellied sheath-tail Bat (*Saccolaimus flaviventris*).

Avoid and minimise principles were considered through the planning stage of the proposed development as well as the location within the wider lot. The location of the land to service the requirements of residential development in Fullerton Cove that has been zoned appropriately with residual C2 lands, therefore, the proposal is considered a suitable position for the Subject Site. The thorough investigation and design iterations during the Planning Proposal ensured the principles of avoid and minimise by utilising the lower quality cleared land that continues to be managed whilst the area containing higher quality vegetation of biodiversity value will be retained, illustrating that the development is located within the most suitable, disturbed part of the site.

Furthermore, the preparation of a Biodiversity Management Plan for the C2 land, implementation of the principles of water sensitive urban design and landscaping within the Subject Site will contribute to the minimisation of impacts through:

- Enhancement of flora and fauna habitat within the C2 lands, improving the condition ensuring an improved future vegetation integrity score;
- Environmentally-friendly lighting design that avoids light-spill into surrounding areas of native vegetation;
- Water quality and quantity treatment devices designed to ensure an improvement;
- Landscaping using trees endemic in the area; and

- Fencing where relevant, to reduce the likelihood of edge effects and prevent fauna incursions in active commercial land.

Biodiversity values were assessed for the Development footprint, resulting in the calculation of Biodiversity Offsets being determined for the Subject Site. The proposal will require the following Ecosystem credits to offset the residual impact of the proposed development:

- 1 x PCT 1646 (moderate);
- 2 x PCT 1717 (poor/managed);
- 8 x PCT 1717 (poor);
- 1 X PCT 1728 (moderate); and
- 8 x PCT 1737 (moderate).

PCT 1646 Severely Degraded VIS score was below 17 (VIS 7.7) and due to the VIS score being below 17 no credits will be incurred for impacts to 1.42ha of this vegetation zone.

The proposal will require the following Species credits to offset the residual impact of the proposed development with assumed presence of Common Planigale due to heritage complications at this stage:

- 24 x Southern Myotis (*Myotis macropus*); and
- 18 x Common Planigale (*Planigale maculata*).

Assessment of the proposal under other relevant environmental policy instruments including *Biodiversity and Conservation State Environmental Planning Policy (Koala Habitat Protection) 2021* (BC SEPP), *Resilience and Hazard State Environmental Planning Policy (Coastal Management) 2021* (HR SEPP). Assessment was undertaken against the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the development only provides potential seasonal foraging habitat for relevant species. The primary consideration under the EPBC Act is Koalas, which are mapped under Port Stephens Comprehensive Koala Plan of Management (PSCKPoM). The assessment in accordance with both the EPBC Act and PSCKPoM showed that the site does not contain core koala habitat therefore no further assessment under the Act is required and referral under the EPBC Act is not likely to be required for this development.

The Subject Site is not mapped as Important Areas and no Grey-headed Flying-fox roost camp is present within the site

The proposal, has also been assessed under other relevant environmental policy instruments including, *Water Management Act, 2000* (WM Act), *Fisheries Management Act, 1994* (FM Act), Port Stephens Local Environmental Plan 2013 (LEP) and Port Stephens Council Development Control Plan, 2014 (DCP), which is detailed within the Appendices.

Table of Contents

Tables

Figures

Appendices

Study Certification and Licensing

This report was written by Kelly Drysdale, reviewed by Simon Purcell and certified by Natalie Black (BAAS no. 19076) of Anderson Environment & Planning.

Staff	Title/Qualification	Tasks
Craig Anderson	Director BAppSc (EAM) BAAS: 18002	Scientific advice
Ian Benson	Director & Principal Ecologist BEng (Civil) GradDipSc (Ecology) BAAS: 18147	Scientific advice
Natalie Black	Senior Environmental Manager / Works Coordinator BSc (Hons), Master Planning, Cert IV (TA) BAAS: 19076	Desktop review of Planning Proposal BDAR, Riparian advice, technical support, report review, report certification.
Simon Purcell	Senior Ecologist/ Works Coordinator BAppSc (Wildlife Science); Cert III Animal Care and Management	Report review
Kelly Drysdale	Ecology Project Manager Ass.Dip. App Sc, Grad Cert BA, TAE	Floristic and habitat assessment, incidental flora and fauna, riparian assessment, report author, BAM-C, Frog survey
Bonni Yare	Ecologist/Botanist BSci (NRM)	Floristic and habitat assessment, incidental flora and fauna, PCT determination.
Alissa Rogers	Ecologist BPrkMgt	GIS
Ben Graham	Ecologist B.Env Sc & Mmgt	GIS
Naomi Stackhouse	Ecologist B.Sc Eco/ Con & Biodiversity Mmgt	Camera deployment and review
Brendon Young	Ecologist B. Ap. Sc. (Fisheries)	Camera deployment and review
Tim Mouton	Senior Ecologist BEncSc; MEnvSc BAAS: 19083	Riparian assessment, PCT determination, BAM plot
Warwick Muir	Senior Ecologist/Arborist Bsc (Biology); DipArb (AQF5)	Frog Surveys
Matt Booker	Ecologist B.Env Sc & Mmgt - under study	Frog 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 certifier, I, Natalie Black, 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;
- Anderson Environment and Planning have no actual, potential or perceived conflicts of interest with Monteath and Powys. Anderson Environment and Planning has received commercial payment for consulting services and assessment by Monteath and Powys for this project.
- 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; and
- 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 Certifier:

Natalie Black

Senior Environmental Ecologist

Anderson Environment & Planning

BAAS no. 19076

Calculator Ref: **00036337/BAAS19076/22/00036338**

24 October 2023

Glossary of Terms

Assessment Area	Land occurring within a 1500m buffer around the Study Area boundary.
BAM	Biodiversity Assessment Method Order (2020) that determines: • Methodology 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)	The 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	The composition, structure and function of ecosystems, and threatened species, populations and ecological communities, and their habitats.
BRW	Biodiversity Risk Weighting
CEEC	Critically Endangered Ecological Community
Council	Port Stephens Council
DAWE	The former Commonwealth Department of Agricultural, Water and Environment
DCCEEW	The Commonwealth Department of Climate Change, Energy, the Environment and Water
DoEE	The former Commonwealth Department of the Environment and Energy
DPI	The NSW Department of Primary Industries
DPE	The NSW Department of Planning and Environment
DPIE	The former NSW Department of Planning, Industry and Environment
Ecosystem credit	The 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
CEEC	Critically Endangered Ecological Community
EPBC Act	The Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
IBRA	Interim Biogeographic Regionalisation for Australia
OEH	The former NSW Office of Environment and Heritage
PFC	Percentage Foliage Cover
Subject Site	Land upon which the development is proposed, and within which residual impacts upon biodiversity are required to be offset, as shown in **Figure 1**
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.

Study Area	Land located at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318. The Study Area is shown on **Figure 1**.
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VIS	Vegetation Integrity Score

1.0 Stage 1 – Biodiversity Assessment

1.1 Introduction

A Commercial Retail Development is proposed within land identified as 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318. At the request of Monteath and Powys C/- Canaan Pty Ltd (the Proponent), Anderson Environment & Planning (AEP) has undertaken the necessary investigations to inform the production of a Biodiversity Development Assessment Report (BDAR) addressing the proposed development.

This BDAR undertaken adheres to the approach outlined in the Biodiversity Assessment Methodology (DPIE 2020a) (the BAM) and the BAM Calculator User Guide (DPIE 2020b).

Data was provided by Kleinfelder as they were commissioned to undertake the BDAR for the subdivision proposal and those works formed the basis for AEP to complete a BDAR for the development and the assigned offsets.

Referenced as ***Biodiversity Development Assessment Report,*** *Proposed Development at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318*. **Kleinfelder Document Number:** NCA20R113598**. Project No:** 20210926.

This BDAR referenced as ***Biodiversity Development Assessment Report***, *Proposed Retail Commercial Development at 42 Fullerton Cove Road, Fullerton Cove NSW 2318.* **AEP reference no 3063.**

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 threshold:

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

Therefore, a BDAR is required, an assessment under Appendix C, Table 12 within Biodiversity Assessment Method Order 2020 (BAM Order). The site is not Biodiversity Valued (BV mapped) lands.

1.1.2 Assessment Scope

The BDAR presented herewith aims to quantify impacts of the proposal upon biodiversity values based upon the methods described within the BAM, including threatened entities listed under the BC Act.

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.

1.1.3 The Proposal

Monteath and Powys are proposing a Commercial Retail Development at 42 Fullerton Cove Road, Fullerton Cove, NSW 2318 which will be situated in the north western section of Lot 14 DP 258848. The concept site plan details a supermarket, retail stores, medical centre, carpark, which includes APZ's and associated infrastructure.

The Study Area covers approximately 6.86ha and the Subject Site zoned B1: Neighbourhood Centre totals approx. 2.46ha, and the remainder of the area zoned C2: Environmental Conservation totalling approx. 4.40ha.

The proposal will require the removal or modification of approx. 2.27ha of native vegetation.

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

1.1.4 General Description of the Subject Site

The Subject Site is located north of Newcastle, and Stockton within a relatively recent urban development of the Fullerton Cove area within the Port Stephens Local Government Area (LGA) (refer **Figure 1**). The Subject Site is zoned B1 Neighbourhood Centre whilst the remainder of the Study Area zoned C2 Environmental Conservation.

The Subject Site consists largely of existing vegetation with cleared areas, access tracks, residential dwellings and sheds within the northern western portion of the allotment. The remainder of the Study Area consists of remnant bush land with a ~45-metre strip of bush land which adjoins the eastern boundary of the Study Area to Nelson Bay Road which is zoned SP2 Infrastructure.

1.1.5 Site Particulars

Table 1 – Site Particulars

Detail	Comments
Client	Monteath and Powys
Address	42 Fullerton Cove Road, Fullerton Cove, NSW 2318
Title(s)	Lot 14 DP 258848
Study Area	Consists of the entirety of Lot 14 DP 258848 (6.86ha)
Subject Site	The Subject Site (2.46ha) primarily consists of existing vegetation, with cleared areas and existing tracks throughout and residential dwellings in the north. The residential dwellings are accessed from Fullerton Cove Road, at the northern end of the Study Area. To the north west and south west of the Study Area land has been cleared for residential development. Bushland exists to the east and south. Between the south eastern border of the Study Area and Nelson Bay Road is a 50m stretch of bushland.
LGA	Port Stephens Council
Zoning	Under the Port Stephens Local Environmental Plan 2013 (pub. 23-12-2013), the Subject Site is zoned B1 Neighbourhood Centre (pub. 14-10-2022) with the remainder of the Study Area zoned C2 Environmental Conservation (pub 14-10-2022).
Current Land Use	The land has been semi maintained around the residential dwelling and sheds.
Surrounding Land Use	To the north and west of the site land is zoned RU2 Rural Landscape. To the east and the south, land is zoned SP2 Infrastructure - Classified Road as it adjoins Nelson Bay Road and Fullerton Cove Road respectively.

Figure 1 depicts the extent of the Subject Site and Study Area. **Figure 2** depicts native vegetation occurring within the Assessment Area.

1.1.6 Geology and Soils

The geology of the Study Area pertains to the Sydney – Newcastle Barriers and Beaches landscape as described by Mitchell (2002). This consists of Beaches and inland dunes made up of quartz sand deposits derived from the Quaternary Period.

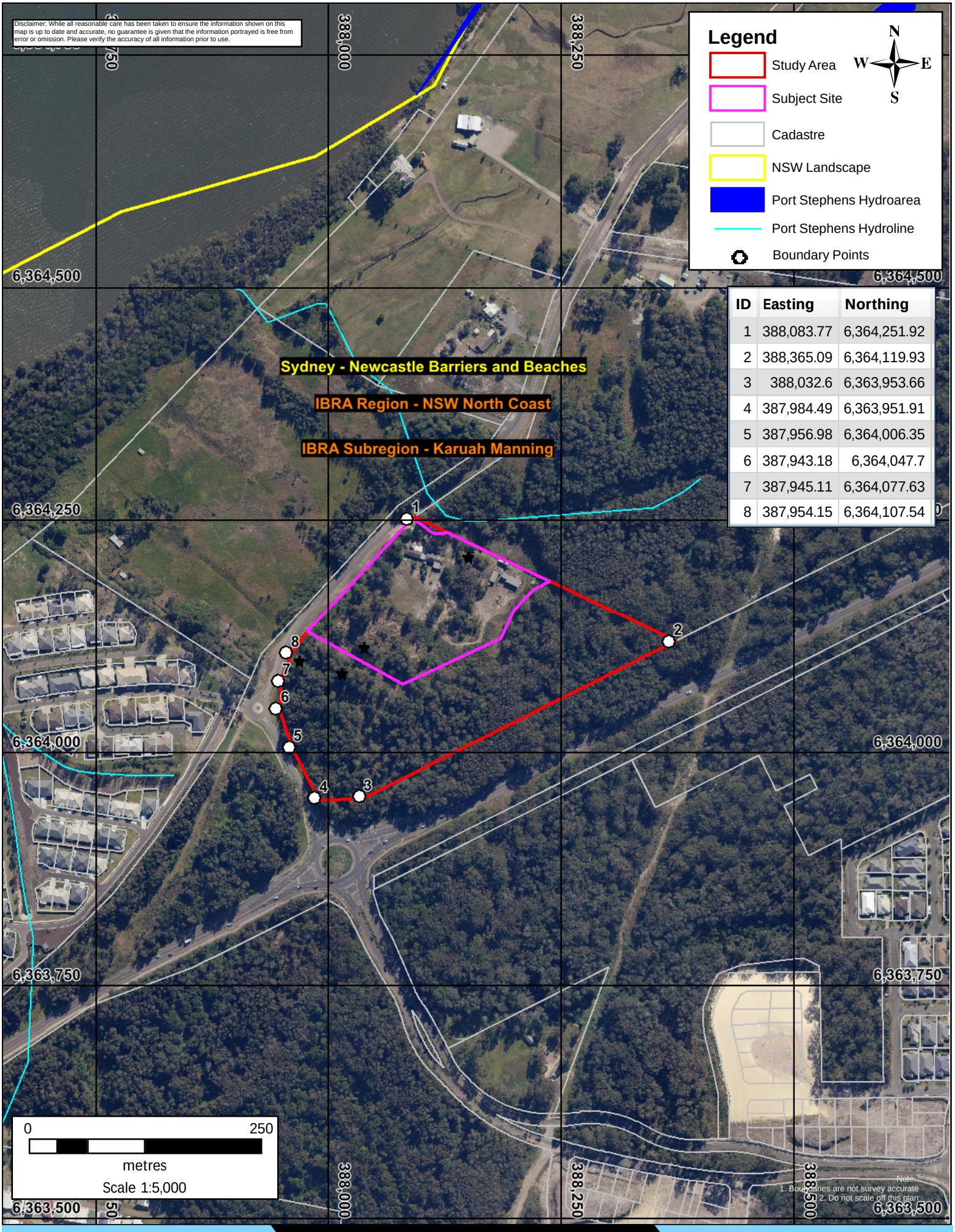
The NSW Soil and Landscape Information System maps a part of the Study Area as Lower Pindimar. Occurrence of these soil types are consistent with poorly drained flats and consist of a brownish – black loamy sand topsoil overlying poorly drained Siliceous sands. The Lower Pindimar Soil Landscape is often associated with Acid Sulphate Soils at depth, seasonal waterlogging, localised permanent

waterlogging, high water-tables and non-cohesive soils. Low-lying areas are prone to localised minor flooding.

1.1.7 Information Sources

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

- Biodiversity Development Assessment Report, Proposed Development at 42 Fullerton Cove Road, Fullerton Cove (Lot 14 DP 258848), NSW 2318. Kleinfelder Document Number: NCA20R113598. Project No: 20210926
- Field surveys conducted within the site and surrounding areas by AEP (2022 & 2023);
- State survey guidelines (DEC 2004; DECC 2009; OEH 2018, DPIE 2020c; DPE 2022).
- PlantNET NSW (https://plantnet.rbgsyd.nsw.gov.au/);
- Aerial Photograph Interpretation (API) of the site and surrounding locality (Google 2023)
- DPE Threatened Biodiversity Profiles (https://www.environment.nsw.gov.au/threatenedSpeciesApp/);
- Search and review of flora and fauna sighting records in the DPE BioNet Atlas within 10km of the site (https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet);
- The NSW OEH BioNet Vegetation Classification;
- Protected Matters Search within a 5km radius of the site held by Commonwealth Department of Climate Change, Energy, the Environment and Water (CDCCEEW) summarising Matters of National Environmental Significance that may occur in, or may relate to the Subject Site;
- DPE *BAM – Important Areas Map* to determine whether the site is mapped as *Swift Parrot, Regent Honeyeater, Migratory Shorebird and Plains-wanderer Important Areas;*
- Collective knowledge gained from previous ecological survey and assessment in the Port Stephens Council area over the past 30 years; and
- Anecdotal records.



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3	388,032.6	6,363,953.66
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5	387,956.98	6,364,006.35
6	387,943.18	6,364,047.7
7	387,945.11	6,364,077.63
8	387,954.15	6,364,107.54

AEP

Title: Figure 1 - Site Location

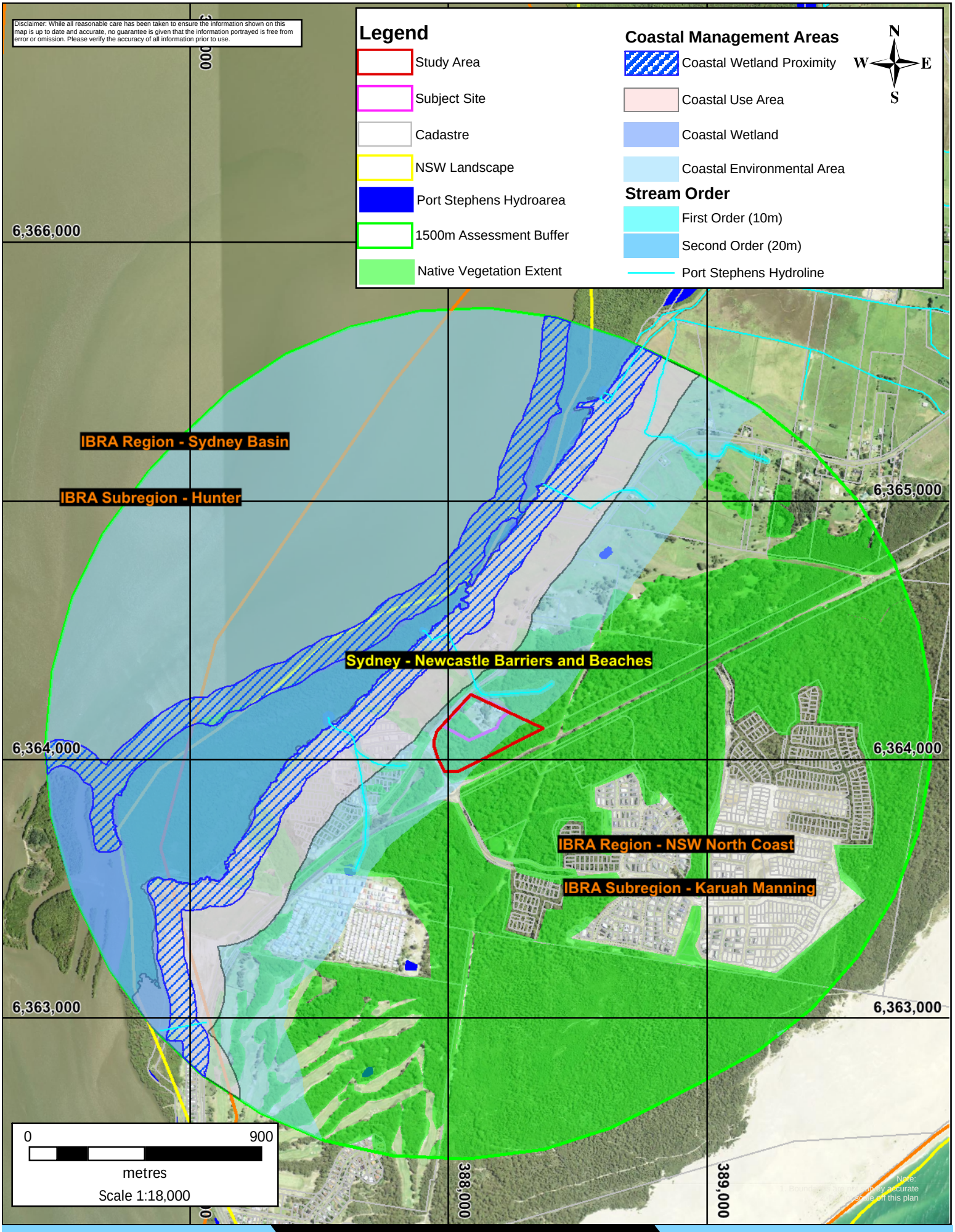
Date: Jan 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS Ref: 36338

Client: Monteath and Powys

AEP Ref: 3063



AEP

Title: Figure 2 - Location Map

Date: Jan 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS Ref: 36338

Client: Monteath and Powys

AEP Ref: 3063

1.2 Landscape Features

1.2.1 Regional Landscapes

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

- IBRA Bioregion: North Coast;
- IBRA Subregion: Karuah-Manning; and
- NSW Landscape: Newcastle Barriers and Beaches and this landscape was selected for use within the BAM calculator. Delineation of NSW Landscape areas are shown in both the Site and Location Maps (**Figure 1** and **Figure 2**).

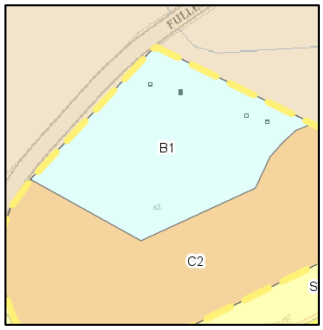
1.2.2 Identified Landscape Features

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	No artificial dams, rivers, stream or estuaries are located within the Study Area. One (1) unnamed first order stream / hydroline is mapped approx. 17m north of the Subject Site that then runs into Fullerton Cove. The first order stream was ground-truthed along the Top of Bank on the southern side of the stream. The Top of Bank line work was used to determine the associated 10m Vegetated Riparian Zone (VRZ). Approx. 275m west of the Subject Site lays the Hunter Wetlands National Park. Fullerton Cove occurs as a tidal estuary and exists as part of the Hunter River system.
Wetlands	A small portion of Study Area, south-west of the Development Site, contains areas of ephemeral forested wetland supporting a *Melaleuca* swamp forest community and a more permanent wetland community dominated by *Typha orientalis* (Broad- leaved Cumbungi). Areas appear to have a tidal influence and are periodically inundated. These communities are discussed further in Section **1.4.** The Port Stephens LEP Flood Planning Map indicates that the majority of the Study Area is mapped as such and appropriate measures will be addressed **Refer Appendix L -** Other Legislation. No parts of the Study Area fall within the Proximity to Coastal Wetlands and Littoral Rainforest Area, or Coastal Use Area but does fall within the Coastal Environment Area Mapping according to the SEPP Coastal Management (2018) and is further discussed in **Appendix L -** Other Legislation.
Native Vegetation Extent	The Study Area (6.86ha) and the Subject Site of (2.46ha) contains 2.27ha of native vegetation of which is proposed to be cleared and with 4.40ha retained within the Study Area. PCTs occurring within the Subject Site are as follows: • PCT 1646 – *Smooth-barked Apple- Blackbutt – Old Man Banksia woodland on coastal sands of the Central and lower North Coast* and is classified into two vegetation classes- moderate and severely degraded; • PCT 1717: *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast* in degraded and managed condition; • PCT 1737: *Typha rushland* in poor condition; and • PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* (Moderate). PCT 1717 (Poor) was considered to be commensurate with the State listed TEC; Swamp Sclerophyll Forest on Coastal Floodplains of the New South

Landscape Feature	Assessment
	Wales North Coast, Sydney Basin and South East Corner Bioregions and is also considered be commensurate with EPBC listed TEC; Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland and met the condition thresholds for this community (addressed in **Appendix G**). Due to the managed and isolated location of PCT 1717 (managed), this PCT is not considered to be associated with the State or Commonwealth listed TECs. PCT 1728 (Moderate) has an impact area of less than 0.007ha where the business signage is proposed to be located. This community is considered to be commensurate with the state listed Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions.
Connectivity Features	Historically, areas of Fullerton Cove extending north-east to Williamtown have been cleared of vegetation and now contain pastureland. Most of the land to the south-east and east of Fullerton Cove, which extends to Stockton sand dunes, remain heavily vegetated. The Subject Site occurs on the boundary of these areas. The Study Area is connected to larger portions of vegetation to the east and south-east, while it borders Fullerton Cove Road and cleared land to the north-west (**Figure 1**). The Subject Site was previously zoned as RU2 Rural Landscape and the landscape reflects this in previously cleared vegetation evident. The vegetation within the Subject Site is not a key area for local connectivity of threatened species and does not represent an important local wildlife corridor. Habitat outside of the Subject Site, and within the Study Area, contains potentially important foraging habitat for threatened species such as the Koala (*Eucalyptus robusta* dominated vegetation), Powerful Owl (forested areas containing arboreal mammals) and Southern Myotis (open water bodies in forested wetland areas). However, these areas will not be fragmented or have fragmentation increased as a result of the proposed development due to adjoining vegetation within and surrounding the Study Area. Therefore, the proposed development would not increase fragmentation on a local scale. The Study Area zoned C2 remains heavily vegetated which connects to the Stockton sand dunes via Worimi Regional Park and Worimi State Conservation Area.
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	The Subject Site occurs within the Newcastle Barriers and Beaches. This landscape is described as: Quaternary coastal sediments on long recurved quartz sand beaches between rocky headlands backed by sand dunes and intermittently closed and open lagoons. Distinct changes in vegetative structure is typical of this landscape when transitioning from coastal beach areas to inland dunes, which often support complex forests containing Blackbutt (*Eucalyptus pilularis*) and Red Bloodwood (*Corymbia maculata*).
Soil hazard features	None known on site.
Features identified by the Secretary's Environmental Assessment Requirements (SEARs)	No SEARs apply to this proposal.
Areas of Outstanding Biodiversity Value (AOBV) under the BC Act:	No areas of AOBV are present on the Subject Site or the adjacent lands.

Landscape Feature	Assessment
Aboriginal Cultural Significance Map (Ex ePlanning Spatial Viewer)	 An Aboriginal Heritage Impact Permit (AHIP) will accompany the DA.

1.3 Site Context Components

1.3.1 Method

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

1.3.2 Landscape Native Vegetation Cover

The Assessment Area, consisting of a 1500m buffer placed around the outside edge of the boundary of the Development Site. The 1500m site buffer contains an area of 812ha of native vegetation cover 330ha or 41% which classes the vegetation cover within >30 – 70%. Within the buffer, the majority of the native vegetation occurs to the east, south and west of the Study Area. To the north of the Study Area is a large expanse of cleared land.

1.4 Native Vegetation

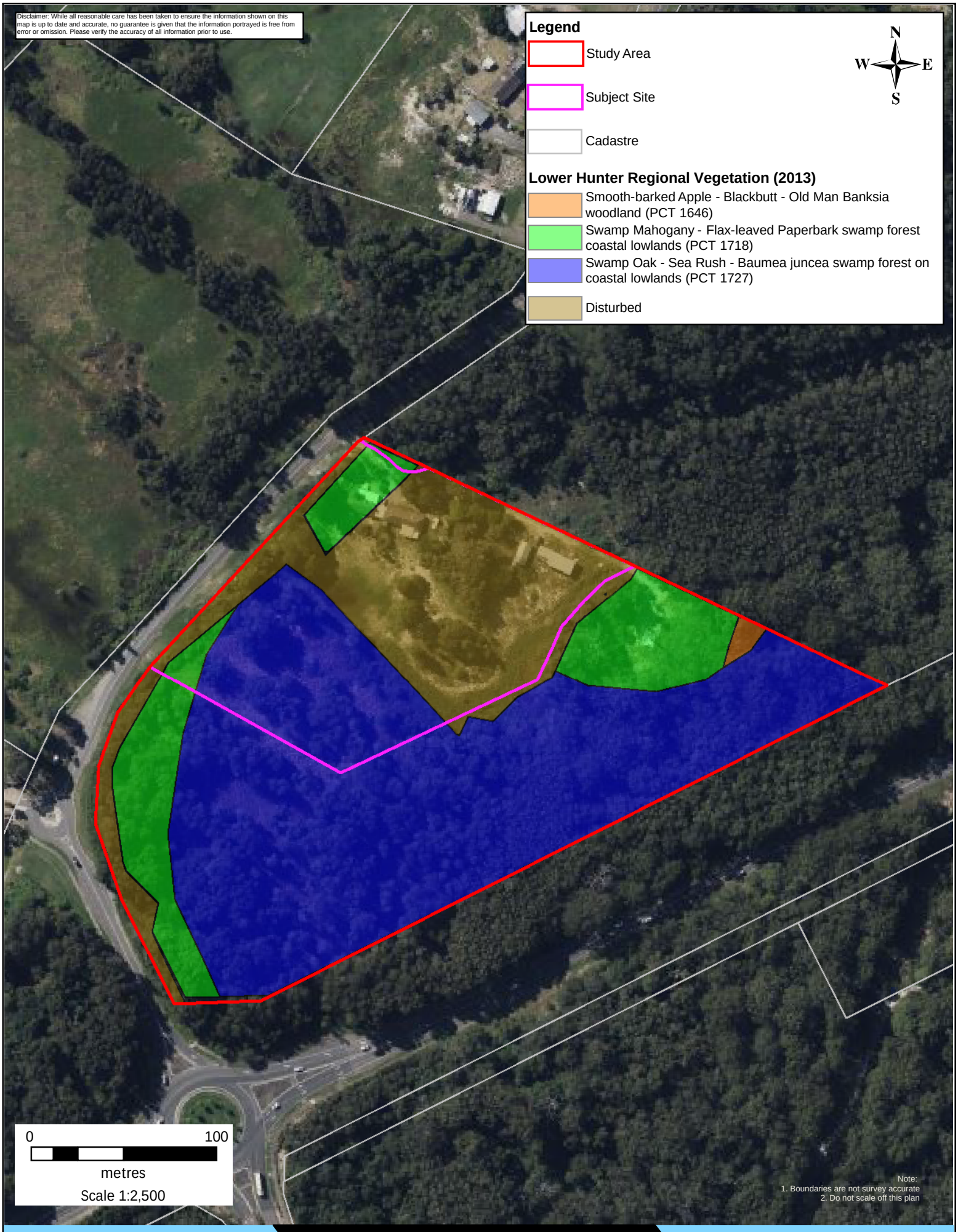
1.4.1 Regional Mapping

Regional vegetation mapping utilised for the site was the Lower Hunter Regional vegetation mapping (2013). The vegetation communities mapped within the area, and their extent, are provided in **Table 3** and **Figure 3.**

Regional vegetation mapping served as a basis for preliminary site assessment. Ground-truthing of vegetation by Klienfelder (2020) and AEP (2022 & 2023) was the prime source of data to inform Plant Community Type determination in the present assessment.

Table 3 – Regional Vegetation Mapping Results

PCT ID	PCT Name	Area
1646	*Smoothbarked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast.*	**0.03**
1718	*Swamp Mahogany – Flax-leaved Paperbark swamp forest coastal lowlands*	**1.05**
1727	*Swamp Oak – Sea Rush – Baumea juncea swamp forest on coastal lowlands*	**4.03**
	Disturbed	**1.72**
Total		**6.83**



AEP

Title: Figure 3 - Regional Vegetation

Date: Jan 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS Ref: 36338

Client: Monteath and Powys

AEP Ref: 3063

1.4.2 Plot Based Floristics Surveys

Flora surveys were undertaken by Kleinfelder in August and September 2020 and AEP undertook a field survey 31st October 2022 to confirm PCT's and ground-truthed vegetation mapping to confirm areas. Surveys aimed to produce a flora species list for the Subject Site, to search specifically for threatened flora and fauna species known to occur within the wider area, and to gather data necessary to both derive vegetation community type(s) and to meet relevant survey guidelines. Such works included:

- Ground-truthing of Kleinfelder and regional vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices;
- Systematic coverage of the site using the Random Meander Technique (Cropper 1993);
- Six (6) BAM plots were undertaken by Kleinfelder within the remnant native vegetation present within the Subject Site. Plots were located randomly within each vegetation zone. Minor modifications to plot locations were made on site due to factors such as ecotones and proximity to disturbed edges. AEP conducted a BAM plot in 2023 to confirm PCT associated with the proposed signage.
- Klienfelder field sheets are provided in **Appendix D**. The location of BAM Plots is depicted in **Figure 4 & 7**.
- AEP ground-truthed the PCT communities and vegetation mapping conducted by Klienfelder to confirm vegetation boundaries and verification of PCT determination.

1.4.3 Plant Community Types (PCTs) and Vegetation Zones

The Subject Site primarily consists of existing vegetation mainly in a severely degraded condition, with cleared areas and existing tracks throughout and a residential dwelling and infrastructure in the north. A number of exotic trees are interspersed around the semi- maintained garden areas.

The Subject Site contains three (3) PCTs, as defined in the BioNet Vegetation Classification database, that were identified within the Subject Site.

- PCT 1646 – *Smooth-barked Apple- Blackbutt – Old Man Banksia woodland on coastal sands of the Central and lower North Coast.*

  This vegetation has been classified into two vegetation classes: Moderate and Severely degraded. This forest vegetation belongs to the Dry Sclerophyll Forests (Shrubby sub-formation) and occurs on the more elevated and better drained areas of the Subject Site.

- PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast.*

  This vegetation has been classified into two vegetation classes: managed and poor. It occurs within a small isolated area of lesser elevation in managed condition and in the south-western portion of the site which is subject to periodic inundation, occurring in poor condition. Within the Study Area, this PCT is classified in most likely in better condition than within the Subject Site.

- PCT 1737: *Typha rushland*.

  Vegetation within this PCT is homogenous throughout the Study Area and is in moderate condition. This vegetation community belongs to the freshwater wetland formation and it intersects with parts of the Swamp Oak – Prickly Paperbark dominated community of the Study Area.

- PCT 1728: Swamp Oak - *Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast*

This vegetation within the C2 land is in moderate condition with an impact area 0.0001ha with a buffer for an impact area of 0.007ha for the proposed business signage. Impacts to this community for the proposed development are considered negligible..

Several high threat weeds are present including *Galenia pubescens* (Galenia), *Schefflera actinophylla* (Umbrella Tree), *Phoenix canariensis* (Canary Island Date Palm), *Bidens pilosa* (Cobbler's Pegs), *Chrysanthemoides monilifera subsp. rotundata* (Bitou Bush), *Anredera cordifolia* (Maderia Vine), *Opuntia stricta* (Prickly Pear), *Ipomoea indica* (Morning Glory), *Pinus elliotti* (Slash Pine), *Cenchrus longispinus* (Innocent Weed), *Eragrostis curvula* (African Lovegrass), *Megathyrsus maximus* (Guinea Grass), *Stenotaphrum secundatum* (Buffalo Grass), *Rumex vulgaris* (Sheep Sorrel), *Rubus anglocandicans* (Blackberry) and *Lantana camara* (Lantana).

Fieldwork by Klienfelder identified five (5) vegetation zones within the Subject Site which are described in **Section 1.4.3** and further refined by AEP. Ground-truthed PCT and vegetation zone mapping for the Subject Site is shown in **Figure 4**. BAM plot photographs are included in the body of the report and with the BAM plot Data **Appendix D** and additional site photographs are provided in **Appendix F**.

1.4.4 PCT Selection Justification

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 system. The identification of TECs must be consistent with the NSW Threatened Species Scientific Committee Final Determination for the TEC.

Diagnostic species recorded on site during fieldwork that support the determination of PCTs and review of floristic data concluded that plots and PCTs were associated as follows. Further justification is provided in **Tables 4 to 8**.

- PCT 1646 (moderate): BAM plot 1;
- PCT 1646 (severely degraded): BAM plots 4 & 5;
- PCT 1717 (poor/managed): BAM plot 6;
- PCT 1717 (poor): BAM plot 2;
- PCT 1728 (moderate) BAM Plot 7; and
- PCT 1737 (moderate): BAM plot 3.

These PCT's were determined by survey data collected by Kleinfelder in their 2021 BDAR and the ground-truthing conducted by AEP in 2022 & 2023.

Table 4 – PCT 1646 *Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – Severely degraded

Vegetation Zone 1	**PCT 1646 – *Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – Severely degraded**
BAM plots	Plots Q4 & Q5
Area of Vegetation Zone	This vegetation zone covers approx. 1.42ha of the Subject Site.
Condition class	Severely degraded
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	Coastal Dune Dry Sclerophyll Forests
Listed Key Diagnostic Species (VIS)	Upper Stratum: *Angophora costata, Eucalyptus pilularis, Corymbia gummifera* Mid Stratum: *Banksia serrata, Monotoca elliptica, Macrozamia communis, Acacia ulicifolia* Ground Stratum: *Dianella caerulea, Themada australis, Pteridium esculentum, Lomandra longifolia, Imperata cylindrica*
Present Key Diagnostic Species within Study Area	Canopy Species: *Eucalpytus pilularis* Mid Stratum: *Banksia serrata, Monotoca elliptica,* Ground Stratum: *Dianella revoluta, Pteridium esculentum, Lomandra longifolia, Imperata cylindrica*
Absence of Key Diagnostic Species within the Study Area	Canopy Species: *Angophora costata, Corymbia gummifera* Mid Stratum: *Macrozamia communis, Acacia ulicifolia* Ground Stratum: *Themeda australis*
PCT description	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. This community extends along the coast from Gosford to Black Head (Darawank Nature Reserve).
Floristic description	This vegetation class occurs in a heavily modified state and floristics are considerably different to those within the low-moderate vegetation class for this PCT. Typically, the upper stratum which usually contains large eucalypt trees are absent from this zone. Trees which occur in this vegetation zone are scattered and generally consist of exotic species (presumably planted), such as *Pinus elliottii* (Slash Pine). Native midstorey species within this zone included *Monotoca elliptica* (Tree Broom-heath) while the native shrub layer consisted of Acacia longifolia. The most dominant native ground cover in this zone was *Cynodon dactylon* (Couch) with a small amount of *Panicum effusum* (Hairy Panic). Dense areas of *Pteridium esculentum* (Bracken Fern) occur within this zone (mainly in the less managed areas which border the Swamp Sclerophyll and Typha rushland areas).
Condition within Development Site	This vegetation zone exists in a highly modified state. The upper stratum is mostly dominated by a mixture of exotic tree species which occur mostly around the existing dwelling. A large portion of the ground cover species are exotic, with species such as *Hydrocotyle bonariensis* and *Eragrostis curvula* dominating. Around the existing dwelling, vegetation is consistently managed and lacks native species. Therefore, the overall condition of this vegetation zone is managed (poor).
Justification for PCT selection	While the vegetation in this zone is highly modified and key diagnostic species are absent, making it difficult to assign a PCT, the topography and soil within the zone align most with that of the PCT 1646. Soil within this zone is sandy and somewhat permeable, remaining relatively dry and lacking the depressions where the soils tend to be saturated and support Swamp Sclerophyll and Typha wetland vegetation. Therefore, this vegetation zone is once likely to have supported the vegetation which occurs within PCT 1646.
Description of Vegetation Zone	This vegetation zone occurs in the southern portion of the site. These areas are highly disturbed, with a high proportion of bare ground and exotic pasture species. This vegetation zone has been highly degraded by sheep and cattle. Natives persist in these areas in low abundance. Canopy Stratum: Represented by large eucalypt trees with a shrubby midstory. The canopy is dominated by *Eucalyptus pilularis* (Blackbutt), with *Eucalyptus piperita* (Sydney Peppermint) and *Banksia serrata* (Old Man Banksia) also present. Mid-Stratum: No clear dominant species, with *Monotoca elliptica* (Tree Broom-heath), *Pittosporum undulatum* (Sweet Pittosporum) and *Alphitonia excelsa* (Red Ash) present. The dominant shrub was *Breynia oblongifolia* (Coffee Bush) with occurences of *Homalanthus populifolius* (Bleeding Heart), *Glochidion ferdinandi* (Cheese Tree), *Clerodendrum tomentosum* (Hairy Clerodendrum), *Persoonia levis* (Broad-leaved Geebung) and *Platysace lanceolata* (Shrubby Platysace). Ground-Stratum: *Imperator cylindrica* (Blady Grass) is the dominant native grass species, with *Hibbertia linearis* (Guinea Flower), *Dianella revoluta* (Blue Flax-lily) and *Lomandra longifolia* also present. The community was characterised by abundant vines and climbers, *Cassytha glabella* (Slender Devil's Twine) being dominant, with *Pandorea pandorana* (Wonga Wonga Vine), *Kennedia rubicunda* (Dusky Coral Pea) *Geitnoplesium cymosum* (Scrambling Lily) and *Sacropetalum harveyanum* (Pearl Vine) also present. Common weeds: *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) and *Lantana camara* (Lantana), with *Megathyrsus maximus* (Guinea Grass) dominant throughout the ground layer.
Status	BC Act: Not listed, EPBC Act: Not listed.
PCT % cleared	45%
VIS	8.2 & 7.9

Vegetation Zone 1	PCT 1646 – *Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – Severely degraded

Plate 1: PCT 1646: *Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* (Severely degraded).

Table 5 – PCT 1646 *Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – Moderate

Vegetation Zone 2	**PCT 1646 – *Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – Moderate**
BAM plots	Plot Q1
Area of Vegetation Zone	This vegetation zone covers approx. 0.04ha (rounded to 0.01ha) of the Subject Site.
Condition class	Moderate
Vegetation formation	Dry Sclerophyll Forests (Shrubby sub-formation)
Vegetation Class	Coastal Dune Dry Sclerophyll Forests
Listed Key Diagnostic Species (VIS)	Upper Stratum: *Angophora costata, Eucalyptus pilularis, Corymbia gummifera* Mid Stratum: *Banksia serrata, Monotoca elliptica, Macrozamia communis, Acacia ulicifolia* Ground Stratum: *Dianella caerulea, Themeda australis, Pteridium esculentum, Lomandra longifolia, Imperata cylindrica*
Present Key Diagnostic Species within Study Area	Canopy Species: *Eucalpytus pilularis* Mid Stratum: *Banksia serrata, Monotoca elliptica,* Ground Stratum: *Dianella revoluta, Pteridium esculentum, Lomandra longifolia, Imperata cylindrica*
Absence of Key Diagnostic Species within the Study Area	Canopy Species: *Angophora costata, Corymbia gummifera* Mid Stratum: *Macrozamia communis, Acacia ulicifolia* Ground Stratum: *Themeda australis*
PCT description	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. This community extends along the coast from Gosford to Black Head (Darawank Nature Reserve).
Floristic description	This coastal dune forest community is represented by large eucalypt trees with a shrubby midstorey. The dominant eucalypt species is *Eucalyptus pilularis* (Blackbutt) with *Eucalyptus piperita* (Sydney Peppermint) occurring less frequently. *Banksia serrata* (Old Man Banksia) was also present as an overstorey species. No clear dominance was seen between the midstorey species, and a mixture of species such as *Monotoca elliptica* (Tree Broom-heath), *Pittosporum undulatum* (Sweet Pittosporum) and *Alphitonia excelsa* (Red Ash) were present. The dominant shrub encountered was *Breynia oblongifolia* (Coffee Bush) with less frequent occurrences of moist forest shrub species such as *Homalanthus populifolius* (Bleeding Heart), small individuals of *Glochidion ferdinandi* (Cheese Tree) and *Clerodendrum tomentosum* (Hairy Clerodendrum). Heathy species such as *Persoonia levis* (Broad-leaved Geebung) and *Platysace lanceolata* (Shrubby Platysace) were also present within the shrub layer. Native ground cover species included one species of grass, *Imperator cylindrica* (Blady Grass), small shrubs such as *Hibbertia linearis*, forbs such as *Dianella revoluta* (Blue Flax-lily) and the rush, *Lomandra longifolia* (Spiny-headed mat-rush). Native vines and climbers were abundant within this community. The most dominant species being *Cassytha glabella*, with other notable species including *Pandorea pandorana* (Wong Wonga Vine), *Kennedia rubicunda* (Dusky Coral Pea), *Geitonoplesium cymosum* (Scrambling Lily) and *Sarcopetalum harveyanum* (Pearl Vine). Infestations of weeds were present. The most dominant being *Chrysanthemoides monilifera* subsp. *rotundata* (Bitou Bush) and *Lantana camara* (Lantana). A high proportion of the ground cover was comprised of exotic grass species such as *Megathyrsus maximus* (Guinea Grass).
Condition within Development Site	The vegetation zone is degraded by weed encroachment. The most prevalent species being Bitou Bush, Lantana and Guinea Grass. These three species contribute to roughly 80% of the foliage cover of the ground layer, with the remaining exotic species contributing to approximately 1% of the cover. Due to this level of weed encroachment the condition of this vegetation community within the Subject Site is moderate.
Justification for PCT selection	This community is commensurate with the PCT 1646 (BioNet Vegetation classification) due to a number of descriptive attributes. The vegetation community within this zone is represented by a tall (20m+) open - closed Eucalypt Forest dominated by *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus piperita* (Sydney Peppermint) with an influence of *Banksia serrata* (Old Man Banksia). A shrubby understorey comprised of wet-forest species and heathy species, while the ground cover consisted of scattered herbs, vines and one native grass species *Imperator cylindrica* (Blady Grass). This vegetation community occurs on costal sands derived from the Quaternary period and occurs within the North Coast IBRA region and Karuah-Manning sub-IBRA region. Additionally, diagnostic species as *Banksia serrata* and *Monotoca elliptica* were present within the community. While only a small portion of this community extends into the Development Site, the largest portion occurs within the Study Area, outside of the development zone. These areas contained *Angophora costata* (Smooth-bark Apple) within the canopy layer in conjunction with *Eucalyptus pilularis* (Blackbutt). Topography also changes through this community and higher areas are typically support a drier vegetation community with a more open canopy cover while lower-lying areas, such as the area within the Development Site, have influences of wet-forest species and generally have a higher canopy cover.
Status	BC Act: Not listed, EPBC Act: Not listed.
PCT % cleared	45%
VIS	57.9

Vegetation Zone 2	PCT 1646 – *Smooth-barked Apple – Blackbutt – Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – Moderate

Plate 2: PCT 1646: ***Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast*** **(Moderate).**

Table 6 – PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast – Poor/Managed

Vegetation Zone 3	**PCT 1717: *Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* – (Poor/Managed)**
BAM plots	Plot Q6
Area of Vegetation Zone	This vegetation zone covers approx. 0.11ha of the Subject Site.
Condition class	Poor/Managed
Vegetation formation	Forested Wetlands
Vegetation Class	Coastal Swamp Forests
Listed Key Diagnostic Species (VIS)	Canopy Species*: Casuarina glauca, Melaleuca quinquenervia, Eucalyptus robusta, Livistona australis* Mid Stratum*: Melaleuca linariifolia; Glochidion ferdinandi;* Ground Stratum: *Entolasia marginata; Gahnia clarkei; Imperata cylindrica; Lomandra longifolia; Dianella caerulea;*
Present Key Diagnostic Species within Study Area	Canopy Species*: Casuarina glauca, Melaleuca quinquenervia, Livistona australis* Mid Stratum*: Glochidion ferdinandi* Ground Stratum: *Imperata cylindrica, Lomandra longifolia*
Absence of Key Diagnostic Species within the Study Area	Canopy Species*: Eucalyptus robusta* Mid Stratum*: Melaleuca linariifolia* Ground Stratum: *Entolasia marginata, Gahnia clarkeii, Dianella caerulea*
PCT description	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. This community is common on coastal floodplains and poorly drained lowlands from the Broadwater to Failford. It mainly occurs on unconsolidated sediments at elevations below 50m. More isolated examples occur as far south as Macmasters Beach.
Floristic description	This vegetation community is dominated by remnant *Melaleuca quinquenervia* (Broad-leaved Paperbark) in the overstorey, which occur as large mature trees. Both *Livistona australis* (Cabbage Palm) and *Glochidion ferdinandi* (Cheese Tree) are present within the midstorey layer. Limited native ground cover exists within this area. *Cynodon dactylon* (Couch) is the dominant native grass species, while forbs such as *Dichondra repens* (Kidney Weed), *Oxalis perennans* and *Hydrocotyle sidthorpioides* were present. A low abundance of the vine *Cayratia clematidea* (Native Grape) and the fern *Telmatoblechnum indicum* (Swamp Water Fern) were also present. A large portion of the ground cover is dominated by exotic species. The most dominant being *Stenotaphrum secundatum* (Buffalo Grass), *Richardia humistrata*, *Paronychia brasiliana* (Brazilian Witlow) and *Hypochaeris radicata* (Catsear).
Condition within Development Site	This vegetation zone exists in a highly modified state and is regularly managed with mowing and clearing The ground cover is dominated by exotic grass and herbs. Various exotic ornamental plants also occur throughout this community. The upper stratum is still dominated by remnant *Melaleuca quinquenervia* which is characteristic of this community. Exotic species account for more than 60% of the total cover of this community. Due to the low native species diversity and high exotic species diversity and cover, this community is considered to exist in a degraded state and in poor condition.
Justification for PCT selection	The community identified within the Development Site is dominated by *Melaleuca quinquenervia* and contains a lower abundance of *Livistona australis* and *Glochidion ferdinandi.* PCT 1717 is characterised by the dominance of *Melaleuca quinquenervia*, *Eucalyptus robusta, Livistona australis* and *Casuarina glauca*. The absence of *E. robusta* and *C. glauca* within the community is likely a result of previous land management. Additionally, a larger area of this PCT with good vegetation integrity occurs within the Study Area and is dominated by *M. quinquenervia* and *E. robusta* with a small influence of *C. glauca.* PCT 1717 is also characterised by various forbs, grasses and sedges. The community within the Subject Site lacked these native species, however it is likely a result of previous land management. This community occurs on sandy soil in a poorly-drained depression in proximity to Fullerton Cove. These are similar to the descriptive attributes to PCT 1717, which occur on poorly-drained lowlands and coastal floodplains between the Central Coast and Failford (Mid North Coast). The community within the Subject Site is similar in floristic composition to PCT 1230 and PCT 1724. However, PCT 1230 contains dominant upper stratum species such as *Lophostemon suaveolens* and *Corymbia intermedia*, both of which are typically north coast species, where this PCT occurs. The Karuah – Manning subregion is likely its southernmost occurrence. PCT 1724 is more consistent in floristics to the community within the Development Site than PCT 1230 and is very similar to that of PCT 1717. Both PCT 1717 and 1724 occur in low-lying coastal areas and are associated with the Sydney – Newcastle Barriers and Beaches landscapes. The main difference is the occurrence of PCT 1724 over Sandstone substrates, while PCT 1717 is not listed to occur over Sandstone. Typical soils and lithology of the Fullerton Cove area include sandy loams and alluvial soils overlying estuarine sediments. While the vegetation is highly managed and contains numerous exotic species, the dominant floristic composition, landscape position and soil profiles are most commensurate with characteristics of PCT 1717.
Status	This vegetation zone is considered to be too degraded to be commensurate with the associated TEC's.
PCT % cleared	68%
VIS	36.4

Vegetation Zone 3	PCT 1717: *Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* – (Poor/Managed)

Plate 3 - PCT 1717: *Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak – Saw Sedge swamp forest of the Central Coast and Lower North Coast* (Poor/Managed).

Table 7 – PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast (Poor)

Vegetation Zone 4	**PCT 1717: *Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* (Poor).**
BAM plots	Plot Q2
Area of Vegetation Zone	This vegetation zone covers approx. 0.46ha of the Subject Site.
Condition class	Poor
Vegetation formation	Forested Wetlands
Vegetation Class	Coastal Swamp Forests
Listed Key Diagnostic Species (VIS)	Canopy Species*: Casuarina glauca, Melaleuca quinquenervia, Eucalyptus robusta, Livistona australis* Mid Stratum*: Melaleuca linariifolia; Glochidion ferdinandi;* Ground Stratum: *Entolasia marginata; Gahnia clarkei; Imperata cylindrica; Lomandra longifolia; Dianella caerulea;*
Present Key Diagnostic Species within Study Area	Canopy Species*: Casuarina glauca, Melaleuca quinquenervia,* Mid Stratum*: None.* Ground Stratum: *None.*
Absence of Key Diagnostic Species within the Study Area	Canopy Species: *Eucalyptus robusta, Livistona australis* Mid Stratum: *Melaleuca linariifolia; Glochidion ferdinandi;* Ground Stratum: *Entolasia marginata; Gahnia clarkei; Imperata cylindrica; Lomandra longifolia; Dianella caerulea;*
PCT description	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. This community is common on coastal floodplains and poorly drained lowlands from the Broadwater to Failford. It mainly occurs on unconsolidated sediments at elevations below 50m. More isolated examples occur as far south as Macmasters Beach.
Floristic description	This vegetation community is dominated by remnant *Melaleuca quinquenervia* (Broad-leaved Paperbark) in the overstorey, *Casuarina glauca* is present in low abundance. The vine, *Parsonsia straminea* (Common Silk Pod) was also present within this zone. The midstorey is absent. Limited native ground cover exists within this area. *Cynodon dactylon* (Couch) is the dominant native grass species, while forbs such as *Dichondra repens* (Kidney Weed), *Oxalis perennans* and *Hydrocotyle sidthorpioides* were present. A low abundance of the vine *Cayratia clematidea* (Native Grape) and the fern *Telmatoblechnum indicum* (Swamp Water Fern) were also present. A large portion of the ground cover is dominated by rushes; *Triglochin sp*. *Typha orientalis* and *Baumea articulata*. Forbs, *Persicaria strigosa* and *Alternanthera denticulata* were also present in low abundance. High threat species, *Ipomoea indica* (Morning Glory) is present in low abundance.
Condition within Development Site	This community contains an open canopy of medium – large trees and a relatively non-diverse ground layer. Areas of open, unvegetated water occur within the area. Majority of the species identified were native, while a low cover of exotic species (*Hydrocotyle bonariensis, Ipomoea indica* (Morning Glory) and *Alternanthera philoxeroides* (Alligator Weed) occurred scattered throughout the vegetation zone. The relatively low species diversity may be attributed to inundation caused by recent heavy rainfall events resulting in large areas of open water throughout this zone. As such, the vegetation community is regarded to be in a moderate condition.
Justification for PCT selection	PCT 1728 was previously determined to be the most appropriate PCT by Kleinfelder, however the dominance of *Melaleuca quinquinervia* and low abundance of *Casuarina glauca* within the Study Site, aligned the community more closely with PCT 1717. Further, this community failed to meet the description and condition thresholds for the associated TEC's aligned with PCT 1728 due to the low abundance of *Casuarina glauca*. PCT 1728 is present within the Study Area in the south-west and much of the area is ecotonal between these communities. PCT 1717 was determined to be the more appropriate PCT within the site and was determined to be commensurate with the state and federally listed TEC's, recognising that this vegetation zone is ecotonal between the two communities, but more closely aligned to PCT 1717 over 1728.
Status	BC Act: BC Act: Swamp Oak Floodplain Forest of New South Wales North Coast, Sydney Basin and Status South East Corner Bioregion, EPBC Act: Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland.
PCT % cleared	68%
VIS	35.5

Vegetation Zone 4	PCT 1717: *Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* (Poor).

Plate 4 - ***PCT 1717: Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp*** **(Poor).**

Table 8 – PCT 1737: *Typha rushland* (Poor)

Vegetation Zone 6	**PCT 1737: *Typha rushland* (Moderate).**
BAM plots	Plots Q3
Area of Vegetation Zone	This vegetation zone covers approx. 0.27ha of the Subject Site.
Condition class	Moderate
Vegetation formation	Freshwater Wetlands
Vegetation Class	Coastal Freshwater Lagoons
Listed Key Diagnostic Species (VIS)	Canopy Species*: Melaleuca quinquenervia* Mid Stratum*:* None Ground Stratum: *Typha orientalis, Persicaria strigosa, Cladium procerum, Cynodon dactylon*
Present Key Diagnostic Species within Study Area	Canopy Species*: Melaleuca quinquenervia* Mid Stratum: None Ground Stratum: *Typha orientalis, Persicaria strigosa, Cynodon dactylon*
Absence of Key Diagnostic Species within the Study Area	Canopy Species*: Eucalyptus robusta* Mid Stratum*: Melaleuca styphelioides; Melaleuca nodosa* Ground Stratum: *Cladium procerum*
PCT description	Tall Rushlands dominated by Typha. Melaleuca may occur as isolated emergents. This community typically occurs at the margins of standing fresh water along the coast from about Woy Woy to Hexham. There is one isolated occurrence in the Goulburn River NP. Substrates are generally sands and muds. Coastal occurrences have elevations of less than 50m. The western occurrence has an elevation of 367m.
Floristic description	This vegetation community is largely dominated by the rush *Typha orientalis* (Broadleaf Cumbungi). Most areas of PCT 1737 lack open water due to the density of *Typha orientalis*. The freshwater fern, *Cyclosorus interruptus,* was scattered throughout this community. Some forbs and sedges, such as *Persicaria strigosa* (Spotted Knotweed) and *Machaerina articulata* (Jointed Twig-rush) were also present. Typically, an overstorey was not present in this community. However, trees such as *Melaleuca quinquenervia* and *Casuarina glauca* from the adjoining Swamp Mahogany swamp forest encroach and overhang on the edges of this community. Some exotic weed species were present such as *Ipomoea indica* (Morning Glory), *Stenotaphrum secundatum* (Buffalo Grass) on the edge of the community which transitions to PCT 1646, and *Rubus fruticosus* (Blackberry).
Condition within Development Site	Only a small portion of this community occurs within the development site. Typically, it is influenced by exotic weed species as it transitions into the degraded PCT 1646. The Typha rushland community is considered to exist in a moderate condition within the development area.
Justification for PCT selection	PCT 1737 was considered an appropriate fit for the vegetation community due to its dominance of *Typha orientalis* and due to the lack of an overstorey. Both *Typha orientalis* and *Persicaria strigosa* were common within the community and are diagnostic species. The community was confined to small low-lying patches between forested areas of *Casuarina glauca* and *Melaleuca quinquenervia*. This PCT occurs within the New South Wales North Coast Bioregion and within the Karuah – Manning subregion.
Status	BC Act: Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions, EPBC Act: Not listed.
PCT % cleared	70%
VIS	59.1

Vegetation Zone 6	PCT 1737: *Typha rushland* (Moderate).

Plate 5 - PCT 1737: *Typha rushland* (Moderate).

Table 9 – PCT 1728: Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast (Moderate)

Vegetation Zone 4	**PCT 1728: *Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* (Degraded).**
BAM plots	Plot 7
Area of Vegetation Zone	This vegetation zone covers approx. 0.007ha of the Subject Site located in the C2 zoned land where the business signage is proposed to be located. The smallest area that can be utilised and accepted within BAM-C is 0.01ha.
Condition class	Moderate
Vegetation formation	Forested Wetlands
Vegetation Class	Coastal Swamp Forests
Listed Key Diagnostic Species (VIS)	Canopy Species*: Casuarina glauca* Mid Stratum*: Melaleuca styphelioides, Melaleuca nodosa* Ground Stratum: *Carex appressa; Juncus usitatus; Hypolepis muelleri; Gahnia clarkei; Entolasia marginata; Cynodon dactylon; Persicaria hydropiper; Baumea articulata;*
Present Key Diagnostic Species within Study Area	Canopy Species*: Casuarina glauca* Mid Stratum*: Melaleuca styphelioides* Ground Stratum: *Carex appressa; Baumea articulata*
Absence of Key Diagnostic Species within the Study Area	Canopy Species*:* none Mid Stratum*: Melaleuca nodosa* Ground Stratum: *Juncus usitatus; Hypolepis muelleri; Gahnia clarkei; Entolasia marginata; Cynodon dactylon; Persicaria hydropiper;*
PCT description	Casuarina dominated Swamp Open Forests with a myrtaceous mid-stratum. The ground stratum be dominated by ferns; sedges or grasses depending on local inundation periods. This community is found in poorly drained sites from East Gosford north to Tuncurry. Substrates are unconsolidated sediments and elevations are below 20m.
Floristic description	This vegetation has the characteristics of a wetland community. The overstorey within this community is dominated by both *Casuarina glauca* (Swamp Oak) with a midstorey that contained *Melaleuca styphelioide* (Prickly-leaved Tea Tree), *Livistona australis* (Cabbage Tree Palm) and *Glochidion ferdinandi* (Cheese Tree). The ground cover consisted mainly of *Enydra woollsii, Phragmites australis* (Common Reed), *Carex appressa* (Tall Sedge), with lesser amounts of *Carex fascicularis* (Tassel Sedge), *Baumea articulata* (Jointed Twig-Rush), *Persicaria strigose, Cyclosorus interruptus* and *Lythrum salicaria* (Purple Loosestrife). Vines, such as *Parsonsia straminea* (Common Silkpod) were evident within this community.
Condition within Development Site	This community contains an open canopy of medium – large trees and a relatively non-diverse ground layer. Majority of the species identified were native, while a low cover of exotic species (*Hydrocotyle bonariensis* (Kurnell Curse / Pennywort)*, Ipomoea indica* (Coastal Morning Glory) and *Alternanthera philoxeroides* (Alligator Weed) occurred scattered throughout the vegetation zone. The relatively low species diversity may be attributed to inundation caused by recent heavy rainfall events resulting in small areas of open water throughout this zone. As such, the vegetation community is regarded to be in a moderate condition. Road side incursion with weeds is evident and better condition vegetation occurs further into the allotment.
Justification for PCT selection	PCT 1728 was deemed an appropriate representation of this vegetation community within the Development Site due to the overstorey dominated by *Casuarina glauca* and *Melaleuca styphelioides.* The ground-layer consists of forbs, including the diagnostic species *Baumea articulata and Carex appressa* and presence of climbers such as *Parsonsia straminea* (Monkey Rope). This community is represented within the New South Wales North Coast Bioregion and Karuah – Manning subregion and is typically located on poorly drained sites. This community is the best fit with PCT 1728 descriptor of being “Casuarina dominated Swamp Open Forests with a myrtaceous mid-stratum. The ground stratum be dominated by ferns; sedges or grasses depending on local inundation periods at elevations below 20m” and is regionally mapped as such. PCT 1722 was considered utilising diagnostics of *Livistona australis; Casuarina glauca; Melaleuca styphelioides* but was lacking in *Eucalyptus Robusta* and discarded as were the surrounding PCT’s already identified within the Subject Site.
Status	BC Act: BC Act: Swamp Oak Floodplain Forest of New South Wales North Coast, Sydney Basin and Status South East Corner Bioregion, EPBC Act: Not listed.
PCT % cleared	81%
VIS	61.5

Vegetation Zone 4	PCT 1728: *Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* (Degraded).

Plate 6 & 7- PCT 1728: ***Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast*** **(Moderate).**

The dimensions of the sign are as indicated below with a total footprint impact area of 0.0001ha, however a 3m buffer has been placed around the sign footings that extend out to the power pole located on Council lands of 0.007ha (refer **figure 12**). The smallest area that can be utilised and accepted within BAM-C is 0.01ha, hence one credit each for impacted native vegetation and Common Planigale is applicable.

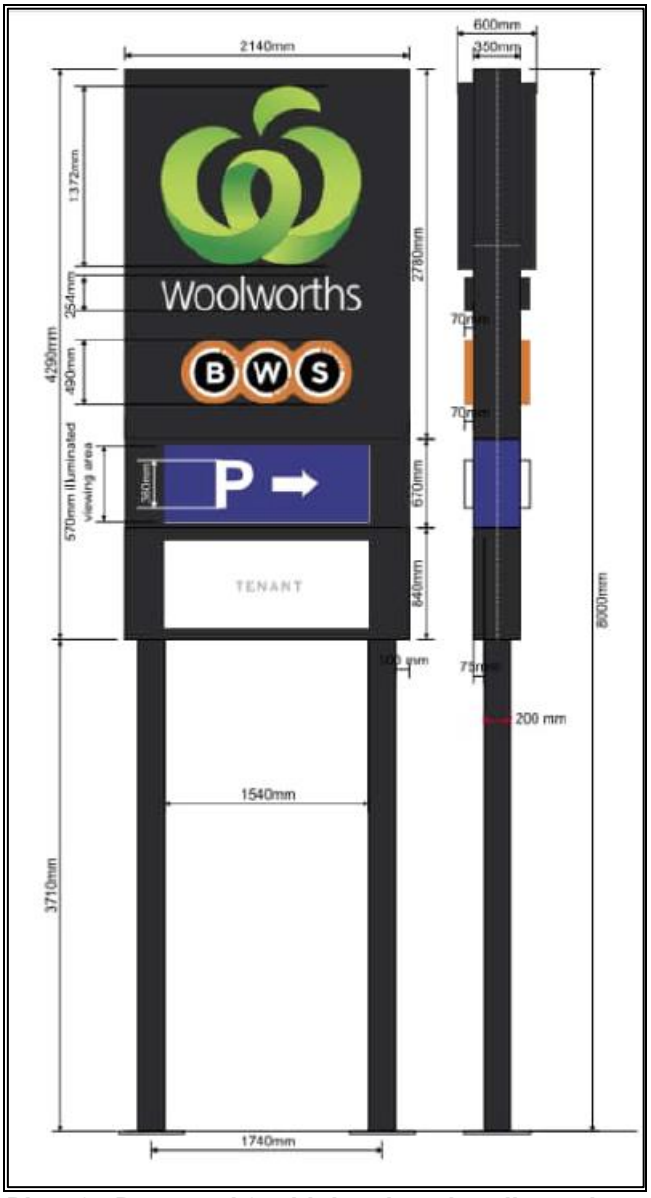


Plate 8 –Proposed 8m high pylon sign dimensions

1.4.5 Non-native / Cleared / Existing Infrastructure

A portion of the Subject Site of 0.19ha have been identified as tracks and infrastructure as it includes residential dwellings and sheds.

It should be noted that a portion of PCT 1646 within the Subject Site is severely degraded with VIS scores <9 and includes high levels of weed species, exotic gardens plantings and semi maintained/mowed larger paddock areas. Refer **Plate 8** of residential infrastructure and ground cover.

Plate 9 – Existing sheds and infrastructure nearby to main residence

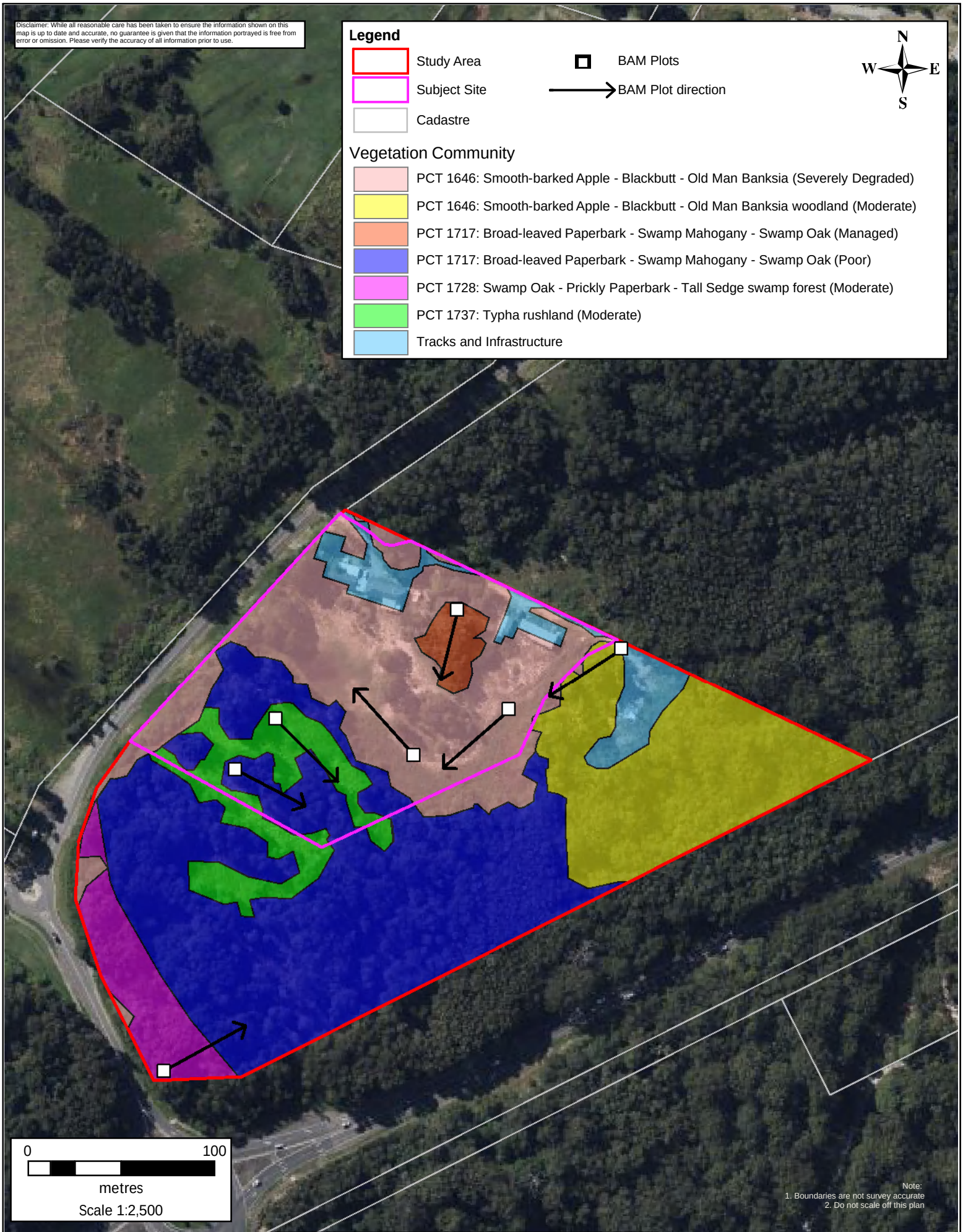
Additional site photographs are included in **Appendix F**.

Table 10 provides a summary of the vegetation within the Site.

Table 10 – Summary of Vegetation Zones Areas

Zone	Vegetation Community	Condition	Total Study Area (ha)	Retained Area within Study Area (ha)	Total Subject Site / Area of Removal (ha)
1	PCT 1646	Severely Degraded	1.62	0.20	1.42
2	PCT 1646	Moderate	1.14	1.14	0.004 (rounded to 0.01)
3	PCT 1717	Poor / Managed	0.11	0.00	0.11
4	PCT 1717	Poor	2.78	2.32	0.46
5	PCT 1728	Moderate	0.36	0.35	0.007
6	PCT 1737	Moderate	0.49	0.22	0.27
Total Native Vegetation (ha)			**6.51**	**4.24**	**2.27**
7	Non-native / Cleared / Existing Infrastructure		0.36	0.16	0.19
Total Non-native / Cleared / Existing Infrastructure (ha)			**0.36**	**0.16**	**0.19**
Total (ha)			**6.86**	**4.40**	**2.46**

Discrepancies in numbers are due to rounding.



AEP

Title: Figure 4 - Ground-truthed Vegetation

Date: Sept 2023

Location: 42 Fullerton Cove Road, Fullerton Cove, NSW

BOAMS: 36338

Client: Monteath and Powys

AEP Ref: 3063

1.4.6 Vegetation Integrity Assessment

1.4.5.1 Patch Size

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

1.4.7 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 11**) and includes corresponding condition scores along with the overall vegetation integrity score. 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;
- 16 - 24 Highly Degraded; and
- <15 - Severely Degraded.

PCT 1717 within the Subject Site had two vegetation zones which are classified was poor, however did vary in structure and composition. The variation within the community was due to one area being managed while the other area was unmanaged. To ensure these vegetation conditions can be identified within the BAM – C an additional Vegetation Condition Class has been added to PCT 1717 being Poor / Managed.

Table 11 – Vegetation Integrity Score

Site Attribute	PCT 1717		PCT 1737	PCT 1728	PCT 1646		
Plot #	**2**	**6**	**3**	**7**	**1**	**4**	**5**
Location	388032 E 6364114 N	388150 E 6364209 N	388058 E 6364146 N	387989 E 6363955 N	388233 E 6364176 N	388171 E 6364152 N	388128 E 6364120 N
Bearing	113	194	142	17	230	221	322
Tree	2	2	2	2	8	0	0
Shrub	0	0	0	1	8	1	3
Grass & Grass-like	2	1	2	4	2	3	1
Forb	2	3	0	2	2	1	1
Fern	1	1	1	1	1	1	1
Other	1	2	1	2	8	1	0
Composition Condition Score	**20.8**	**28.1**	**41.3**	**40.5**	**55.3**	**13.2**	**6.8**
Tree	45	32	6	25	77.5	10	0
Shrub	0	0	0	10	11.7	0.1	4
Grass & Grass-like	11	1	70.1	40.5	1	5.2	2
Forb	20.2	2.2	0	15.1	0.6	0.1	2
Fern	5	0.1	2	1	5	15	25
Other	1	1.1	0.2	4	7.8	0.2	0
Structure Condition Score	**34.2**	**29.6**	**84.8**	**57.5**	**44.1**	**4.0**	**4.8**
Regenerating Stems (<5cm DBH)	Absent	Absent	Absent	Present	Present	Absent	Absent
Stem Classes (cm DBH)	5-9, 10-19, 20-29, 30-49	10-19, 30-49	Nil	5-9, 10-19, 20-29, 30-49	10-19, 20-29	Nil	Nil
# Large Trees	4	6	0	2	3	0	0
Hollow-bearing Trees	0	0	0	0	0	0	0
Litter Cover (%)	100	33	100	95	95	33	57

Site Attribute	PCT 1717		PCT 1737	PCT 1728	PCT 1646		
Plot #	**2**	**6**	**3**	**7**	**1**	**4**	**5**
Coarse Woody Debris (m)		0	5	102	41	0	0
High Threat Weed Cover	5	23.8	10.2	3	80.4	29.2	48
Function Condition Score	**63.2**	**58.1**	**0**	**100**	**79.5**	**10.2**	**14.9**
Current Vegetation Integrity Score	**35.5**	**36.4**	**59.1**	**61.5**	**57.9**	**8.2**	**7.9**

1.5 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 (DPE).

A predicted Ecosystem Credit Species assessment is presented in **Table 12**, and a Species Credit Species assessment is presented in **Table 13**.

Field surveys were undertaken by Klienfelder between 8 July 2020 to 23 December 2021 and from 31 October 2022 by AEP. A summary of survey effort within the Subject Site is included in **Section 1.4** and **Table 13**, and species listed are presented in **Appendix B** and **Appendix C.**

Figure 5 shows the location of NSW BioNet Atlas records of threatened species in the locality.

1.5.1 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' (BRW) for a species is based on the 'sensitivity to loss' and 'sensitivity to potential gain' score using criteria listed in Appendix I 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 12**.

Table 12 – Predicted Ecosystem Credit Species

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (NSW BioNet Wildlife Atlas 2019) Y/N	Recorded within site or nearby surrounds by Klienfelder Y/N
Mammals				
Syconycteris australis	Common Blossom-bat	High	N	N
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	High	N	N
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	Y	Y
Falsistrellus tasmaniensis	Eastern False Pipistrelle	High	Y	Y
Phoniscus papuensis	Golden-tipped Bat	High	N	N
Scoteanax rueppellii	Greater Broad-nosed Bat	High	Y	N
Pteropus poliocephalus	Grey-headed Flying-fox (foraging)	High	Y	N
Miniopterus orianae oceanensis	Large Bent-winged Bat (foraging)	High	Y	N
Miniopterus australis	Little Bent-winged Bat (foraging)	High	Y	Y
Dasyurus maculatus	Spotted-tailed Quoll	High	N	N
Petaurus australis	Yellow-bellied Glider	High	N	N
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	High	Y	Y
Birds				
Rostratula poliocephalus	Australian Painted Snipe	Moderate	N	N

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (NSW BioNet Wildlife Atlas 2019) Y/N	Recorded within site or nearby surrounds by Klienfelder Y/N
Botaurus poiciloptilus	Australasian Bittern	Moderate	Y	N
Ninox connivens	Barking Owl (foraging)	High	N	N
Ixobrychus flavicollis	Black Bittern	Moderate	N	N
Ephippiorhynchus asiaticus	Black-necked Stork	Moderate	Y	N
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Moderate	N	N
Irediparra gallinacea	Comb-crested Jacana	Moderate	N	N
Caldris ferruginea	Curlew Sandpiper (foraging)	High	Y	N
Tyto longimembris	Eastern Grass Owl	Moderate	Y	N
Pandion crisatus	Eastern Osprey (foraging)	Moderate	Y	N
Epthianura albifrons	White-fronted Chat	Moderate	Y	N
Callocephalon fimbriatum	Gang-gang Cockatoo (foraging)	Moderate	N	N
Calyptorhynchus lathami	Glossy Black-Cockatoo (foraging)	High	N	N
Caldris tenuirostris	Great Knot (foraging)	High	Y	N
Stictonetta naevosa	Freckled Duck	Moderate	N	N
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Moderate	Y	N
Hieraaetus morphnoides	Little Eagle (foraging)	Moderate	Y	N

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (NSW BioNet Wildlife Atlas 2019) Y/N	Recorded within site or nearby surrounds by Klienfelder Y/N
Glossopsitta pusilla	Little Lorikeet	High	Y	N
Anseranas semipalmata	Magpie Goose	Moderate	N	N
Tyto novaehollandiae	Masked Owl (foraging)	High	Y	N
Ninox strenua	Powerful Owl (foraging)	High	Y	Y
Anthochaera phrygia	Regent Honeyeater (foraging)	High	N	N
Chthonicola sagittata	Speckled Warbler	High	N	N
Circus assimilis	Spotted Harrier	Moderate	Y	N
Lathamus discolor	Swift Parrot (Foraging)	Moderate	Y	N
Limicola falcinellus	Broad-billed Sandpiper (Foraging)	High	Y	N
Limosa limosa	Black-tailed Godwit (Foraging)	High	Y	N
Lophoictinia isura	Square-tailed Kite (Foraging)	Moderate	Y	N
Xenus cinereus	Terek Sandpiper (foraging)	High	Y	N
Neophema pulchella	Turquoise Parrot	High	Y	N
Daphoenositta chrysoptera	Varied Sittella	Moderate	N	N
Haliaeetus leucogaster	White-bellied Sea-Eagle	High	Y	N
Hirundapus caudacutus	White-throated Needletail	High	N	N

1.5.2 Species Credit Species

Additional threatened fauna species determined by the BAM calculator that have the potential to use the Subject Site as suitable habitat are identified in **Table 13**.

The flora and fauna species lists for the site are included in **Appendix B** and **Appendix C.**

Table 13 – Potential Species Credit Species

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Flora					
Allocasuarina simulans Nabiac Casuarina	3	Y	0	N/A	The Nabiac Casuarina is restricted to the mid-north coast of NSW, from Nabiac to Forster and is very rare. The Nabiac Casuarina grows in heathland on coastal sands.
Angophora inopina Charmhaven Apple	2	N	0	N/A	Endemic to the Central Coast region of NSW. The known northern limit is near Karuah where a disjunct population occurs; to the south populations extend from Toronto to Charmhaven with the main population occurring between Charmhaven and Morisset. There is an unconfirmed record of the species near Bulahdelah. Approximately 1250 ha of occupied habitat has been mapped in the Wyong–southern Lake Macquarie area. Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges. Occurs most frequently in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina woodland/forest; (ii) Hakea teretifolia–Banksia* oblongifolia wet heath*; (iii) Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina sedge woodland; (iv) Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest. Flowers Spring to Summer.
Asperula asthenes Trailing Woodruff	2	N	0	N/A	Occurs in damp sites, often along river banks.
Callistemon linearifolius Netted Bottle Brush	1.5	N	0	N/A	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers Spring to Summer.
Corybas dowlingii Red Helmet Orchid	2	N	0	N/A	Restricted to the central coast and Hunter regions of New South Wales where it is currently known from the Port Stephens, Bulahdelah, Lake Macquarie and Freemans Waterhole areas.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Cryptostylis hunteriana Leafless Tongue Orchid	1.5	N	0	N/A	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.
Diuris arenaria Sand Doubletai	3	Y	0	N/A	Sand Doubletail is known from the Tomaree Peninsula. Occurs in coastal heath and dry grassy eucalypt forest on sandy flats in gently undulating country in eucalypt forest with a grassy understorey on clay soil.
Diuris praecox Rough Doubletail	1.5	N	0	N/A	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 July to early September.
Eucalyptus camfieldii Camfield's Stringybark	2	Y	0	N/A	Poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. Coastal heath mostly on exposed sandy ridges. Occurs mostly in small scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of *Eucalyptus oblonga* (Narrow-leaved Stringybark), *E. capitellata* (Brown Stringybark) and *E. haemastoma* (Scribbly Gum).
Eucalyptus parramattensis subsp. decadens	2	N	11	All BioNet records are south of the Subject Site, >1km away.	This species is associated with low moist areas alongside drainage lines and adjacent to wetlands. It is often found in woodland on sandy soils. The endangered population occurs on sandy alluvium within a floodplain community which also supports *Eucalyptus robusta* (Swamp mahogany), *E. tereticornis* (Forest Red Gum), *E. gummifera* (Sydney Bloodwood) as well as *Melaleuca* (Paperbark) species.
Grevillea parviflora subsp. parviflora Small-flower Grevillea	2	N	0	N/A	Grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Sydney region occurrences are usually on tertiary sands and alluvium, and soils derived from the Mittagong Formation. Occurs in a range of vegetation types from heath and shrubby woodland to open forest. In Sydney it has been recorded from Shale Sandstone Transition Forest and in the Hunter in Kurri Sand Swamp Woodland. However, other communities are occupied in other locations where the species can be found.
Lindernia alsinoides	2	N	0	N/A	Recorded in the mid-coastal areas from Bulahdelah to Coopernook, including coastal populations at Forster (e.g. Cape Hawke); and with occurrences further north at Shannon Creek west of

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Noah's False Chickweed					Coutts Crossing and also at Bungawalbyn and near Casino, in the far NSW North Coast. Grows in swamp forests and wetlands along coastal and hinterland creeks.
Maundia triglochinoides	2	N	3	All three records are located >5kms north east of the Subject Site in road side drains and swampy area.	Occurs in permanent swamps and wetlands (30-60cm deep) on the central and north coasts of New South Wales; although locally common at individual sites the number of known locations is small and these are highly scattered.
Melaleuca biconvexa Biconvex Paperbark	2	N	0	N/A	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.
Melaleuca groveana Grove's Paperbark	2	N	0	N/A	Widespread, scattered populations in coastal districts north of Yengo National Park to southeast Queensland. Also found as a disjunct population near Torrington on the northern tablelands. Grove's Paperbark grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. It also occurs in dry shrubby open forest and woodlands.
Persicaria elatior Tall Knotweed	2	N	0	N/A	This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. 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.
Prostanthera densa Villous Mint-bush	2	N	0	N/A	This species has been recorded from the Currarong area in Jervis Bay, Royal National Park (Marley), Cronulla, Helensburgh and Port Stephens (Nelson Bay). The Sydney and Royal National Park populations were thought possibly extinct, but the species is now known to occur at Bass and Flinders Point in Cronulla. *Prostanthera densa* generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea. Plants regenerate from rootstock after fire and flower within the first year or two.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Pterostylis chaetophora	2	N	0	N/A	The preferred habitat is seasonally moist, dry sclerophyll forest with a grass and shrub understorey. Flowers from September to November. Vegetative reproduction is not common in this group of Greenhoods, but some species may form more than one dropper annually. Fails to flower in dry seasons.
Rhizanthella slateri Eastern Australian Underground Orchid	3	Y	0	N/A	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. This is a highly cryptic species (almost growing entirely beneath the soil) and its habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest.
Tetratheca juncea Black-eyed Susan	2	N	0	N/A	Confined to the northern portion of the Sydney Basin bioregion and the southern portion of the North Coast bioregion in the local government areas of Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Cessnock. It is usually found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. The majority of populations occur on low nutrient soils associated with the Awaba Soil Landscape. While some studies show the species has a preference for cooler southerly aspects, it has been found on slopes with a variety of aspects. It generally prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral. It usually spreads via underground stems which can be up to 50 cm long. Consequently, individual plants may be difficult to identify. It also reproduces sexually but this requires insect pollination. Large populations of this species are particularly important.
Thesium australe Austral Toadflax	1.5	N	0	N/A	An erect, straggly perennial herb somewhat cryptic amongst dense vegetation found in small, scattered populations across eastern NSW. A root parasite that takes water and some nutrient from other plants, especially Themeda australis and occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast, often in damp sites.
Zannichellia palustris	2	N	0	N/A	In NSW, known from the lower Hunter and in Sydney Olympic Park. 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.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Fauna					
Burhinus grallarius Bush Stone-Curlew	2	N	1	The single BioNet record was from 2008 at Kooangang Island, approx. 4km south west from the Subject Site.	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.
Calidris tenuirostris *Great Knot*	3	Y	138	Most records occur around the Hunter Wetlands National Park areas, >3kms south from the Subject Site.	Within 5km of coast or tidal influenced water body. In NSW, the species has been recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November. Most birds return north in March and April; however, some individuals may stay over winter in Australia. Forages for food by methodically thrusting its bill deep into the mud to search for invertebrates, such as bivalve molluscs, gastropods, polychaete worms and crustaceans.
Callocephalon fimbriatum Gang-gang Cockatoo	2	Y	0	N/A	The species favours tall mountain forests and woodlands (particularly heavily timbered/mature wet sclerophyll forests) in spring and summer. In winter and autumn, the species moves to lower latitudes and occupies drier more open eucalypt forests and woodlands including dry forest in coastal areas and is often found in urban areas.
Calyptorhynchus lathami Glossy Black-Cockatoo	2	N	0	N/A	The species is uncommon although widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. An isolated population exists on Kangaroo Island, South Australia. The species inhabits open forest and woodlands of the coast where stands of She-oak occur. The species is dependent on large hollow-bearing eucalypts for nest sites where the animals will lay a single egg between March and May.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
					Glossy Black-Cockatoos feed almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina*), shredding the cones with the massive bill. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, but also recorded in open woodlands dominated by Belah (*Casuarina cristata*).
Cercartetus nanus Eastern Pygmy-possum	2	N	0	N/A	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*) dreys 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.
Crinia tinnula Wallum Froglet	1.5	N	21	Most records are >5kms from the Subject Site apart from one record in 2021 from the eastern side of the Newcastle Golf course.	While found in a range of habitats the species is usually associated with acidic swamps on coastal sand plains. Typically occurs in sedge lands and wet heathlands and can also be found along drainage lines. Breeds in swamps with permanent water as well as shallow ephemeral pools and drainage ditches.
Dromaius novaehollandiae - endangered population Emu population in the New South Wales North Coast Bioregion and Port	2	N	1	BioNet details a 2019 *record of Dromaius novaehollandiae* >4kms north east from the Subject Site.	On 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. Emus are omnivorous, taking a wide range of seeds and fruits, invertebrates (mainly insects) and foliage and other plant material. They take material directly from plants or bend down to take items from the ground, picking up the food and tossing them back in the throat before swallowing. The population of Emus in the NSW North Coast Bioregion and Port Stephens LGA is of significant

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Stephens local government area					conservation value as the last known population in northern coastal NSW, and for the role that birds play in dispersing large seeds of native plant species, and over long distances
Haliaeetus leucogaster White-bellied Sea-Eagle	2	N	386	Numerous sightings within BioNet, mostly concentrated along the coastline with the closest 2015 record to the Subject Site, approx. 730m north east.	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.
Hieraaetus morphnoides Little Eagle	1.5	N	7	All records situated on the Hunter Wetlands areas National Park areas, the closest from 2010 >3kms south from the Subject Site.	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.
Hoplocephalus bitorquatus Pale-headed Snake	2	N	0	N/A	The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The diet of the Pale-headed Snake consists largely of tree frogs, although ground-dwelling frogs, lizards and small mammals are also taken. The Pale-headed Snake is relatively unusual amongst elapid snakes in that it is well adapted to climbing trees.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Litoria aurea Green and Golden Bell Frog	2	N	14	Majority of records located on Kooragang Island with the closest record from 2011, approx. 1.8kms south from the Subject Site.	Habitat for the species includes semi-permanent/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. The survey efforts were considered adequate given the highly disturbed nature of the site and low quality of the habitat present. Additionally, the only two records of the species within the Atlas search are located 4km south west of the Subject Site and date back to January 2000.
Litoria brevipalmata Green-thighed Frog	1.5	N	0	N/A	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 heavy rainfall event over 72 hrs as the most probable time to survey and detect the species. Note that tadpoles are susceptible to injury during netting, and 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. Green-thighed Frogs occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range, but extends into drier forests in northern NSW and southern Queensland
Myotis macropus Southern Myotis	2	N	8	One BioNet record occurs within the Study Area as an acoustic recording from Klienfelder studies in 2020.	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). 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.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Petalura gigantea Giant Dragonfly	3	Y	0	N/A	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. Requires surveying within the swamp. Distances that the species disperses to breed are dependent on the elevation of the terrain around the swamp, and are more likely to disperse further if the terrain surrounding the swamps is flat (low elevation). There are gaps in our knowledge about this species, particularly relating to emergence patterns - the species lives as a larva for six or more years before emerging as an adult with a short flying season. Emergences are unpredictable in space and time and data to date show complex patterns of spatial synchrony in changing abundance of adults among years. It is thus virtually impossible to determine how the species would respond to management.
Petauroides volans Greater Glider	2	N	0	N/A	The species is allocated to species credit because it occurs across a broad range of vegetation types and can be reliably detected from survey. Typically produce one young per year (in high quality habitat) but during poor conditions may only breed every second year.
Petaurus norfolcensis Squirrel Glider	2	N	10	All BioNet records are south of Nelson Bay Road with the closest record from 2011 approx. 750m east from the Subject Site.	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 integrifolia/oblongifolia/serrata/spinulosa and Xanthorrhoea spp*.
Phascogale tapoatafa Brush-tailed Phascogale	2	N	0	N/A	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 25cm 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 – 40ha, while males have overlapping territories often greater than 100 ha. They nest and shelter in tree hollows with entrances 2.5 - 4cm wide and can use many different hollows over a short time span. Mating occurs May – July.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Turnix maculosus Red-backed Button-quail	2	N	0	N/A	In Australia, the Red-backed Button-quail extends discontinuously from the Kimberley region of Western Australia, through the Top End of the Northern Territory and the southern Gulf of Carpentaria, to Cape York Peninsula and eastern Queensland and central-eastern and north-eastern NSW. It is mainly a species of coastal and subcoastal regions. The Red-backed Button-quail is recorded only infrequently in NSW, with most records from the North Coast Bioregion; 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 Buffel 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. Red-backed Button-quail usually breed in dense grass near water, and nests are made in a shallow depression sparsely lined with grass and ground litter. They are nocturnal and crepuscular in their activity.
Uperoleia mahonyi Mahony's Toadlet	2	N	10	Majority of BioNet records are >4.5kms from the Subject Site, apart from a 2021 record east of the Newcastle golf club.	Emergency listed species. Observations indicate the species inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. 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.
Lophoictinia isura Square-tailed Kite	1.5	N	3	The closest record from 2014 located in the North Arm Hunter River area approx. 1.7kms south west from the Subject Site.	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 be nesting where Kites might be recorded. Kites will need to be in attendance to confirm breeding sites.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Ninox strenua Powerful Owl	2	N	4	One BioNet record occurs within the Study Area that was observed from the from Klienfelder studies in 2020 Previous assessments within the Study Area (Ecobiological, 2011) have recorded this species within the Study Area.	The species inhabits a range of vegetation types from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tree hollows (≥0.5m deep) in large eucalypts (DBH 80-240cm) that are at least 150 years old. Powerful Owls are a dual credit species. Foraging habitat is considered an ecosystem credit and breeding is considered a species credit.
Pandion cristatus Eastern Osprey	1.5	N	77	Majority of records located around the Hunter wetlands National Park with the closest record from 2011 located approx. 500m north from the Subject Site.	The Osprey has a global distribution with four subspecies previously recognised throughout its range. However, recent studies have identified that there are two species of Osprey - the Western Osprey (*P. halietus*) with three subspecies occurring in Europe, Asia and the Americas and the Eastern Osprey (*P. cristatus*) occurring between Sulawesi (in Indonesia), Australia and New Caledonia. Eastern Ospreys are found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas.
Ninox connivens Barking Owl	2	Y	0	N/A	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Roosts in shaded portions of tree canopies. Requires large old trees with hollows for nesting. Barking Owl are a dual credit species. Foraging habitat is considered an ecosystem credit and breeding is considered a species credit
Phascolarctos cinereus Koala	2	N	20	Majority of records located along Nelson Bay and	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

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
				Cabbage tree roads. The closest record from 2015 was located at the far end of the park on Seaside Boulevard, Fern Bay. 300 Metres SE from Nelson Bay Rd roundabout. Another record from 2015 in Fern Bay has also been observed.	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.
Planigale maculata Common Planigale	2	N	1	A single BioNet record from 2018 on camera trap made by MJD Environmental surveys, located approx. 1km north from the Subject Site along Nelson Bay Road	Small insectivore of the Marsupial Mice functional group and 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.
Potorous tridactylus Long-nosed Potoroo	2	N	1	A single BioNet record from 2006 of hair/skin, located >5kms north east from the Subject Site close to Williamstown.	The long-nosed potoroo is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. Mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5ha. Breeding peaks typically occur in late winter to early summer and single young is born per litter.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements
Tyto novaehollandiae Masked Owl	2	N	2	Two BioNet records from 2006 and 2007, with the former located approx. 815m south from the Subject Site.	Lives in dry eucalypt forests and woodlands from sea level to 1100m. Uses large tree hollows or sometimes caves for nesting. Dead stags are used for roosting/breeding habitat Masked Owl can nest in living or dead trees with hollows greater than 20cm diameter. In Tas and Vic Masked owls have been recording nesting in paddock trees. Has been found to nest in caves in Tasmania but there is no evidence to suggest that this occurs in NSW.

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1.5.3 Field Survey Methods

Surveys by Klienfelder were deemed to fulfill minimum survey requirement apart from Brush-tail Phascogale, Common Planigale and sufficient frog surveys which were then completed by AEP apart from Common Planigale due to heritage issues. Details of the flora and fauna survey are presented in **Tables 15** and **18** and were conducted using relevant guidelines, in particular DPE survey guidelines for threatened plants (2020) and amphibians (2020), along with applicable EPBC guidelines (2010; 2011). Flora Survey Effort, Threatened Flora Sightings and Fauna Survey Effort is shown in **Figures 7** and **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**.

1.5.3.1 Habitat Features Surveys

An assessment of the relative habitat values present within the Study Area was undertaken by Klienfelder. This assessment focused primarily on the identification of specific habitat types and resources within the Study Area favoured by known threatened 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.

The desktop assessment, including Important Area Mapping and the field surveys for habitat features resulted in the following Potential Credit Species being excluded from the species credits species list in accordance with *Section 5.2.2.2 (a, b or c)* (refer to **Table 14)** for the Subject Site.

Table 14 – Potential Credit Species Excluded and Removed from BAM - C

Scientific Name	Common Name	Habitat Constraints (Y / N)	Habitat Degraded) (Y / N)	Geographic Limitations (Y / N)	Species is Vagrant (Y / N)	Comments
Anthochaera phrygia	Regent Honeyeater	Y	N	N	N	The location is out of the mapped important habitat range for the Regent Honeyeater, *Section 5.2.2.2 (a)*
Caldris ferruginea	Curlew Sandpiper	Y	N	N	N	The location is out of the mapped important habitat range for the Curlew Sandpiper, *Section 5.2.2.2 (a)*
Chalinolobus dwyeri	Large-eared Pied Bat	Y	N	N	N	No caves, karsts or breeding places were identified during the survey period *Section 5.2.2.2 (a)*.
Eucalyptus seeana - endangered population	Eucalyptus seeana population in the Greater Taree local government area	N	N	N	Y	The development is not within the Taree LGA for *E. seena, Section 5.2.2.2 (c)*.
Lathamus discolor	Swift Parrot	Y	N	N	N	The location is out of the mapped important

Scientific Name	Common Name	Habitat Constraints (Y / N)	Habitat Degraded) (Y / N)	Geographic Limitations (Y / N)	Species is Vagrant (Y / N)	Comments
						habitat range for the Swift Parrot, *Section 5.2.2.2 (a)*
Limicola falcinellus	Broad-billed Sandpiper	Y	N	N	N	The location is out of the mapped important habitat range for the Broad-billed Sandpiper, *Section 5.2.2.2 (a)*.
Limosa limosa	Black-tailed Godwit	Y	N	N	N	The location is out of the mapped important habitat range for the Black-tailed Godwit, *Section 5.2.2.2 (a)*
Vespadelus troughtoni	Eastern Cave Bat	Y	N	N	N	No caves, karsts or breeding places were identified during the survey period, *Section 5.2.2.2 (a)*.
Pteropus poliocephalus	Grey-headed Flying-fox	Y	N	N	N	No roost camps were noted within the site for GHFF, *Section 5.2.2.2 (a)*.

Scientific Name	Common Name	Habitat Constraints (Y / N)	Habitat Degraded) (Y / N)	Geographic Limitations (Y / N)	Species is Vagrant (Y / N)	Comments
Miniopterus australis	Little Bent-winged Bat	Y	N	N	N	No caves, karsts or breeding places were identified during the survey period, *Section 5.2.2.2 (a)*.
Miniopterus orianae oceanensis	Large Bent-winged Bat	Y	N	N	N	No caves, karsts or breeding places were identified during the survey period, *Section 5.2.2.2 (a)*.
Petrogale penicillata	Brush-tailed Rock-wallaby	Y	N	N	N	No suitable habitat in the form of rocky escarpments, outcrops and cliffs were suitable for Brush-tailed Rock Wallaby, *Section 5.2.2.2 (a)*.
Xenus cinereus	Terek Sandpiper	Y	N	N	N	The location is out of the mapped important habitat range for the Terek Sandpiper, *Section 5.2.2.2 (a)*.

1.5.3.2 Flora Field Survey

All required flora survey techniques were utilised for targeted survey of the species listed in **Tables 15** and **18** and guided by DPIE Threatened Flora Survey Guidelines (2020) and the BAM (2020).

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

- Ground-truthing of vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices by Klienfelder and AEP.
- Seasonal threatened flora surveys utilising the two-phase grid-based systematic approach, targeting a range of threatened flora by Klienfelder.
- 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 by Klienfelder.
- Six (6) BAM plots were undertaken in accordance with BAM 2020 by Klienfelder.
- One (1) BAM plot was undertaken in accordance with BAM 2020 by AEP in March 2023.
- Assessment of the BAM floristics undertaken by Kleinfelder and Subject Site mapping was further assessed by AEP for accuracy in October 2022.

- Updated/Refined Vegetation Community Mapping involving traversal over the entire Study Area, concentrating particularly on mapping the boundaries between the identified Biometric Vegetation Types of the BAM 2020 and refining the original mapping and classification of Klienfelder data by AEP which involved a few amendments.

1.5.3.3 Fauna Field Surveys

All required fauna survey techniques were utilised for targeted survey of the species listed in **Tables 15** and **18** and guided by the *Threatened Species Survey and Assessment Guidelines* (2004). Survey effort is shown in **Figures 7** and **8**.

The majority of the survey effort was conducted by Kleinfelder, surveys were undertaken by AEP in October 2022 to March 2023. Refer **Table 15.**

1.5.3.4 Incidental Observations

Incidental records of any fauna species observed during fieldwork were noted by Klienfelder and AEP. 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.

1.6 Survey Effort

The survey methods above were utilised across the Subject Site commencing in July 2020 to March 2023. **Table 15** outlines provides a summary of field surveys.

Table 15 – Field Survey Periods

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
08/07/2020	N/A		Targeted Flora transects	*Corybas dowlingii*	1	Klienfelder	Ben Stewart	Refer Table 16
19/08/2020 & 24/08/2020	N/A		Targeted Flora transects	*Allocasuarina simulans, Angophora inopina, Diuris praecox, Eucalyptus camfieldii, Eucalyptus parramattensis subsp. decadens, Grevillea parviflora subsp. parviflora, Melaleuca biconvexa, Melaleuca groveana and Prostanthera densa.*	1	Klienfelder	Ben Stewart	Refer Table 16
12/08/2020 & 17/11/2020	N/A		BAM plots	5 X BAM plots completed 12/08/2020 1 X BAM plot completed 17/11/2020	2	Klienfelder	David Russell Ben Stewart	Refer Table 16
16 & 17/11/2020	N/A		Targeted Flora transects	*Zannichellia palustris, Thesium austral, Maundia triglochinoides, Lindernia alsinoides, Cryptostylis hunteriana, Callistemon linearifolius and Asperula asthenes*.	1	Klienfelder	Ben Stewart	Refer Table 16
22/09/2020	N/A		Targeted Flora transects	*Rhizanthella slateri, Tetratheca juncea, Pterostylis chaetophora* and *Diuris arenaria.*	1	Klienfelder	Ben Stewart	Refer Table 16

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
10/12/2020	N/A		Targeted Flora transects	*Persicaria elatior.*	1	Klienfelder	Ben Stewart	Refer Table 16
22/9/2020	09:30-12:00	2.5	Diurnal habitat tree assessment was used to search for Grey-headed Flying-fox camps and large stick-nests of threatened raptors.	Grey-headed flying fox, White-bellied Sea-Eagle, Little Eagle, Square-tailed kite, Eastern Osprey	1	Klienfelder	Ben Stewart	Refer Table 16
20/08/2020; 24/08/2020; 19/11/2020 and 16/12 2020	Dusk	One person-hour (30mins each) on 4 separate nights	Spotlighting transects were undertaken by two observers from dusk for a one person-hour (30 minutes each) period on four separate nights (20/08/2020, 24/08/2020, 19/11/2020 and 16/12/2020) using high-powered headtorches and hand-held torches. Spotlighting efforts covered both the vegetated areas adjacent to the Development Site that contained hollow bearing trees and the vegetation within the Development Site. Hollows suitable for threatened species, such as Squirrel Gliders and large forest owls, were watched at dusk until suitably dark for fauna to emerge. In addition to hollow watching, calls of threatened species were played at locations across spotlighting transects in an	Nocturnal Surveys targeting Forest Owls (Powerful, Sooty, Barking & Masked Owls), Squirrel Glider, Greater Glider, Red-backed Button quail, Long-nosed Potoroo Call Playback – targeting Koala, Forest Owls (Powerful, Sooty, Barking & Masked Owls), Bush Stone Curlew	2	Kleinfelder	Ben Stewart, Mark Dean	Refer Table 16

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
			effort to elicit a response. Calls were broadcast for 15 mins on each of the four nights across multiple locations. Two nocturnal surveys were conducted on 20/08/2020 and 24/08/2020 targeting forest owls. Both surveys included stag watching one large hollow (>20cm diameter) at dusk.					
12/11 – 26/11/2020	14 nights		A total of six (6) Reconyx HyperfireTM remote trigger cameras were installed at heights of 1.5 m or 3 m for a total of 14 consecutive nights (12/11/2020 to 26/11/2020) (**Figure 8**). Cameras were installed at 1.5 m, targeted Eastern Pygmy-possum and Long-nosed Potoroo, while cameras installed at 3 m, targeted Squirrel Gliders and Koala. Cameras were baited with a mixture of oats, peanut butter, treacle, vanilla essence and truffle oil mixture in a mesh canister, and the surrounding area (including the tree trunk) was sprayed with honey water. Camera baits were checked once during the survey period and re-baited as necessary. Images	Cameras: Eastern Pygmy-possum, Long-nosed Potoroo, Squirrel Glider, Greater Glider, Koala, Brush-tailed Phascogale, Red-backed Button quail, Brush-tailed Phascogale	1	Kleinfelder	Ben Stewart	Refer Table 16

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
			were analysed to identify species captured on camera.					
07/12/2020-11/12/2020	4 nights		Four AnaBatTM ultrasonic recorders (Titley Scientific, Lawnton QLD) were used to passively record the calls of any Microchiropteran bats within the Study Area. Three Anabats were placed within the Swamp Oak Forest areas adject to standing bodies of water. One Anabat was placed within the remnant Swamp Sclerophyll Forest (**Figures 8 & 10**). The units were set up adjacent to open flyway areas and bodies of water which are likely to be favoured by foraging bats. Each Anabat was set-up to record over four consecutive nights (07/12/2020 to the 11/12/2020) of continuous recording from dusk.	Microbats, Southern Myotis	1	Kleinfelder	Ben Stewart	Refer Table 16
17/11/2020	N/A	1	Spot Assessment Technique (SAT), following the methodology of Phillips and Callaghan (2011), was used to survey for Koala scats within the Study Area. One SAT was conducted within the proposed Development Site within the	Koala	1	Kleinfelder	Ben Stewart	Refer Table 16

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
			remnant Swamp Sclerophyll vegetation and surrounds. Another SAT was conducted in remnant Swamp Sclerophyll vegetation, containing large individuals of *Eucalyptus robusta*, outside of the proposed Development Site (**Figure 8**). No SAT was conducted in the Swamp Sclerophyll forest vegetation (PCT 1717) within the proposed Development Site in the south due to water inundation within the area.					
20 & 24/08/2020; 17 & 18/12/2020	06:00 – 7:00 28/08 05:50-07:30 & 18:00 – 19:30 17/12	3 central point locations (20 minute 2-ha census)	Visual and auditory bird surveys were conducted throughout the Development Site and the wider Study Area at three central point locations (20 minute 2-ha census) on 28 August, 17 and 18 December 2020. Surveys were undertaken at dusk and dawn. Meandering bird transects were also undertaken on the 17 and 18 December 2020 targeting areas with suitable hollows for threatened cockatoos. Birds were recorded visually, with the aid of binoculars, or by call interpretation. Weather conditions	Bird Surveys: Bush Stone Curlew, Great Knot, Gang-Gang Cockatoo, Glossy Black Cockatoo, Emu, White-bellied Sea-Eagle, Red-backed Button quail, Square-tailed kite, Eastern Osprey	2	Kleinfelder	Ben Stewart, Dan O'Brien	Refer Table 16

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
			during the survey were warm, clear and calm.					
20/08/2020, 24/08/2020, 19/11/2020 and 16/12/2020	24:00 – 01:00 16/12		Reptile searches were conducted during nocturnal spotlighting searches. Searches targeted both terrestrial and arboreal habitats, such as logs and hollows primarily within the forested areas (to be retained), however, searches also included areas of the Subject Site containing vegetation and debris	Reptiles – Pale-headed snake	3	Kleinfelder	Mark Dean, Dan O'Brien, Ben Stewart	Refer Table 16
26/10/2020 and 16/12/2020. 21/12/2021 & 23/12/2021			Amphibian surveys were conducted between October and December, over two nights (26/10/2020 and 16/12/2020). Surveys were structured around rainfall events and warm nights and consisted of walking transects through suitable habitat (areas containing semi-permanent – permanent water bodies) with stationary listing points along the transect. Amphibians were identified through visual and aural detection using nocturnal spotlighting searches and stationary listening points. The surveys were	Amphibians- Wallum Froglet, Green & Golden Bell Frog, Green-thighed frog, Mahony's Toadlet	3	Kleinfelder	Mark Dean, Dan O'Brien, Ben Stewart	Refer Table 16

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
			repeated in 2021; 21/12/2021 & 23/12/2021					
10/12/2020			Walking transects were conducted on 10/12/2020 through areas of standing water and swamp vegetation, and areas adject to standing water, within (Figure 8). Dragonflies encountered during the survey were collected using a sweep net for closer inspection and identification.	Insects- Giant Dragon Fly	1	Kleinfelder	Ben Stewart	Refer Table 16
07/12 – 11/12/2020			Four Harp Traps, Elliot and Cage Trapping	Southern Myotis, Greater Glider, Squirrel Glider, Brush-tailed Phascogale and Common Planigale.		Kleinfelder	Ben Stewart	Refer Table 16
31/10/2022	8:15am-9:30am	2.5	PCT confirmation of previous ground truthed vegetation	PCT confirmation and incidentals	2	AEP	KD & BY	29.3°C, 0.0mm
07/12/2022	10:00am-1:00pm	3.0	Install seven (7) camera traps	Brush-tailed Phascogale and incidentals	1	AEP	NS	28°C, 0.0mm
14/12/2022	9:00am-10:45am	3.5	Top of bank Riparian assessment	First order stream assessment	2	AEP	KD & TM	26°C, 0.0mm
21/12/2022	9:30am-12:00pm	2.5	Refresh seven cameras and review	Brush-tailed Phascogale and incidentals	1	AEP	NS	22.8°C, 2.0mm

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Company	Staff	Weather (Temp / Rainfall)
04/01/2023	9:00-12:30	3	Collect cameras and review	Brush-tailed Phascogale and incidentals	1	AEP	BY	19.7°C, 0.0mm
22/02/2023	7:30pm – 8:45pm	2.5	Nocturnal search, call playback frog survey	Frog surveys targeting Green and Golden Bell frog, Wallum Froglet, Green-thighed frog and Mahony's toadlet.	2	AEP	KD & WM	21.2°C, 45.6mm
23/02/2023	7:45pm – 8:45pm	2	Nocturnal search, call playback frog survey	Frog surveys targeting Green and Golden Bell frog, Wallum Froglet, Green-thighed frog and Mahony's toadlet.	2	AEP	WM & MB	24.6°C, 35mm
07/03/2023	9:00-11:30	5	BAM plots	1 X BAM plot completed and habitat assessment	2	AEP	KD & TM	37.9°C, 0.0mm

Table 16 – Weather conditions during Klienfelder fauna surveys (reference)

Date	Temps		Rain	9 am				3 pm			
	Min	Max		Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C	mm	°C	%	Km/h		°C	%	Km/h	
Spotlighting and Call play back											
20/08/2020	10.7	18.4	0	14.6	56	NW	41	17.5	40	WNW	41
24/08/2020	8.4	17.9	0	12.0	55	WNW	31	17.3	32	WNW	24
Diurnal Bird survey											
28/08/2020	8.1	19.0	0	16.1	43	W	24	17.0	38	SSE	28
17/12/2020	22.0	31.1	0	25.0	78	N	8	27.1	67	NE	24
18/12/2020	20.8	33.1	13.6	27.8	70	NW	15	23.6	80	NNW	20
Raptor Nest Search											
22/09/2020	15.5	28.0	0.4	23.3	71	WNW	22	26.7	22	WNW	41
Nocturnal Herp / Amphibian											
26/10/2020	13.7	16.8	128.8	15.3	100	SSE	50	14.5	100	S	37
Remote Cameras (12/11 – 26/11)											
12/11/2020	16.4	31.1	0	23.0	67	N	13	30.6	40	ENE	17
13/11/2020	19.0	28.9	4.4	23.0	74	NNE	15	27.7	56	NNE	15
14/11/2020	15.8	24.6	13.6	21.1	72	WNW	9	23.2	63	SE	22
15/11/2020	13.4	30.4	0	20.4	84	NW	7	29.4	51	SE	19
16/11/2020	17.0	38.2	0	24.8	61	N	13	36.9	25	NW	19
17/11/2020	19.4	23.0	5.8	20.9	72	SSE	22	22.0	64	SE	24
18/11/2020	18.3	23.5	0	21.6	60	E	11	22.5	55	ESE	30
Spotlighting and Call play back (19/11)											
19/11/2020	16.3	26.8	0	22.5	59	ENE	15	24.4	56	ENE	30
20/11/2020	15.3	33.3	0	22.5	70	NNW	13	32.7	43	NE	13
21/11/2020	19.4	24.2	0	20.5	75	S	20	22.6	64	SSE	24
22/11/2020	17.1	29.1	0	20.6	85	N	11	24.9	74	ESE	17
23/11/2020	20.3	30.9	0	23.5	77	ESE	13	26.6	51	W	33
24/11/2020	17.5	23.6	0	20.1	76	S	28	22.7	60	SSE	31
25/11/2020	14.1	24.3	0.4	20.7	68	NE	7	23.3	49	ESE	28
26/11/2020	14.7	33.1	0	22.1	65	NW	13	32.3	40	ESE	20
Trapping (Elliot – ground and arboreal, Harp, Anabats, Cages) (07/12 – 11/12)											
07/12/2020	15.4	31.3	0	21.5	56	WNW	13	30.0	20	NW	35
08/12/2020	15.9	22.6	0	20.1	35	W	30	21.2	46	SSE	33
09/12/2020	13.0	24.4	0	19.5	54	WNW	11	23.0	50	ESE	26
Invertebrates (10/12)											
10/12/2020	13.6	27.7	0	20.5	68	NW	9	24.0	62	SSE	33
11/12/2020	18.4	22.3	1.0	19.3	60	SSE	30	20.4	53	SSE	26
Spotlighting / Nocturnal Herp Search (Amphibian)											
16/12/2020	21.3	29.6	14.8	26.2	79	NE	15	27.5	74	NE	31
21/12/2021	21.9	30.6	0.2	27	78	W	11	29.3	71	SE	20
23/12/2021	22.4	-	0	26.3	78	E	19	24.1	84	ENE	13

1.6.1 Survey Effort Results

1.6.1.1 Habitat Trees

A total of fifteen (15) habitat trees with thirteen (13) containing hollows were identified within the Study Area by Kleinfelder. None will be impacted by the development as they are located outside of the Subject Site within the Smooth-bark Apple – Blackbutt community (PCT 1646) and Coastal Swamp Forest community. Habitat trees predominantly contained a variety of small (up to 5cm) and medium (5-20cm) hollows, with one large hollow (30cm). None of the trees showed any clear evidence of occupation by fauna refer **Figures 7** and **8** and data of the HBT survey is detailed in **Table 17** below.

Reiterating that no habitat trees will be impacted within the Subject Site, all are located in the C2 retained land. No hollow bearing trees will be impacted in the C2 land where the proposed business signage will be located.

Table 17 - Habitat Tree Detail

GPS Point ID	Scientific Name	Height of hollow (m)	Evidence of use	Habitat Features	Removed Y/N
1	*Eucalyptus pilularis*	9	No sign of use	Trunk hollow	N
2	*Eucalyptus pilularis*	10	No sign of use	Branch hollow	N
3	*Eucalyptus pilularis*	7	No sign of use	Branch hollow	N
4	*Eucalyptus pilularis*	10	No sign of use	Branch hollow	N
5	*Eucalyptus pilularis*	7	No sign of use	Trunk hollow	N
6	*Eucalyptus pilularis*	15	No sign of use	Branch hollow	N
7	*Eucalyptus pilularis*	8	No sign of use	Branch hollow	N
8	*Eucalyptus pilularis*	9	No sign of use	Trunk hollow	N
9	*Eucalyptus pilularis*	9	No sign of use	Trunk hollow	N
10	*Eucalyptus robusta*	6	No sign of use	Crack/fissure	N
11	*Eucalyptus pilularis*	6	No sign of use	Branch hollow	N
12	*Eucalyptus pilularis*	6	No sign of use	Branch hollow	N
13	*Eucalyptus robusta*	18	Signs of use	Crack/fissure	N
14	*Angophora costata*	22	No sign of use	Branch hollow	N
15	*Eucalyptus pilularis*	10	No sign of use	Branch hollow	N

1.6.1.2 Water Features and Hydrology

No artificial dams, rivers, stream or estuaries are located within the Subject Site. One (1) unnamed first order stream / hydroline is mapped north of the Subject Site in the adjoining allotment that then runs into Fullerton Cove. Approx. 275m west of the Subject Site lays the Hunter Wetlands National Park.

Fullerton Cove that occurs as a tidal estuary and exists as part of the Hunter River system. A Storm Water Management Plan has been commissioned to ensure best practice outcomes given the Ramsar wetlands location, coastal management areas and wetland mapping of the Subject Site. A Flood Impact and Risk Assessment will also be lodged with the DA.

The DPE (Water) administers the WM Act and is required to assess activities carried out on waterfront land. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 meters of the highest bank of the river, lake or estuary. Certain activities within this land are defined as a 'controlled activity' and requires approval from the Office of Water. Further assessment of the first order stream indicates that the closest top of bank stream measurement **is within** 3m of the Subject Site and as such there will be VRZ encroachment within the Subject Site and a Controlled Activity Approval (CAA) will be required to be submitted with the Development Application, refer **Appendix G.** Refer **Figure 6** for impact and retention areas.

A small portion of Study Area, south-west of the Subject Site, contains areas of ephemeral forested wetland supporting a Melaleuca swamp forest community and a more permanent wetland community dominated by *Typha orientalis* (Broad- leaved Cumbungi). Areas appear to have a tidal influence and are periodically inundated. A total of 0.46ha of vegetation is commensurate with Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland EEC, 0.27ha is commensurate with *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC and 0.007ha is commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregion* within the Subject Site.

NSW Government Environment Climate Change and Water (DECCW) – NSW Wetlands Policy states 'Where greenfield sites are identified, mechanisms are in place for councils to provide adequate protection through their local environmental plans (LEPs). Port Stephens DCP 2014 also reiterates that 'Development involving a controlled activity within waterfront land (within 40m from the highest bank of the river, lake or estuary) adheres to the Water Management Act 2000 and subsequent policies which require the provisions of Vegetated Riparian Zones VRZs. Again, the Stormwater Management Plan must demonstrate best practice outcomes given the Ramsar wetlands location and coastal management areas.

No parts of the Study Area exist within areas mapped as coastal wetlands or mapped in proximity to coastal wetlands however the majority of the Study Area, including the Subject Site, are mapped under the Coastal Environmental Area Map according to the SEPP Coastal Management Act (2018) (SEPP Resilience and Hazards 2021) and is further discussed in **Appendix G** - Other Legislation. The Subject Site is flood mapped within the Port Stephens LEP 2013 and is further discussed in **Appendix G.**

1.6.1.3 Other habitat features

The Subject Site possesses additional habitat features including piles of logs, fallen trees and a swamp area that may provide potential habitat.

No caves, karsts or rocky outcrops occurred on site and are considered a habitat constraint for cave dwelling microbats. Artificial structures such as an old sheds and agriculture infrastructure such as machinery, bins, corrugated iron and rubbish exist around the cleared area and were surveyed for potential fauna habitat. No fauna were identified utilising these areas at the time of survey. The Study Area is zoned C2 and consists of remnant vegetation adjoining the Subject Site.

1.6.2 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, song meters) is detailed in **Table 18** and was conducted using relevant guidelines, in particular DPIE survey guidelines for threatened plants (2020) and amphibians (2020), along with applicable EPBC Act

guidelines (2010; 2011). Survey periods are shown in **Table 15** and survey effort in **Figures 7** and **8**. **Table 18** presents the results of targeted surveys.

Table 18 – Species Credit Species

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Flora											
Allocasuarina simulans *Nabiac Casuarina*	All year	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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	Potentially suitable habitat within the Study Area, however it is likely geographically restricted. BAM candidate species.	N/A	N	N	N	N
Angophora inopina Charmhaven Apple	All year	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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	Marginal habitat in the Study Area the species occurs mostly in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina* woodland/forest; (ii) *Hakea teretifolia–Banksia oblongifolia* wet heath; (iii) *Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina* sedge woodland; (iv) *Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest. No known records within locality and most likely geographically restricted. Species has not been detected on site.	N/A	N	N	N	N
Asperula asthenes *Trailing Woodruff*	October – December	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.	Y	Habitat Assessment Targeted Search Parallel Transects	November 17th 2020	Marginal habitat in the Study Area as the species is associated with damp sites, often along riverbanks. Occurs from Taree to Bulahdelah NSW. No known records within locality and most likely geographically restricted.	N/A	N	N	N	N
Callistemon linearifolius *Netted Bottle Brush*	October-January	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.	Y	Habitat Assessment Targeted Search Parallel Transects	November 17th 2020	Potentially suitable habitat within Study Area as the species is associated with dry sclerophyll forest on the coast and adjacent ranges. No known records within the locality.	N/A	N	N	N	N
Corybas dowlingii Red Helmet Orchid	June-July	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.	Y	Habitat Assessment Targeted Search Parallel Transects	July 8th 2020	No suitable habitat present within the Study Area the species which grows in clonal colonies in sheltered areas such as gullies and southerly slopes in tall open forest on well-drained gravelly soil at elevations of 10-200m.	N/A	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Cryptostylis hunteriana Leafless Tongue Orchid	November-January	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.	Y	Habitat Assessment Targeted Search Parallel Transects	November 17th 2020	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. Occurs in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silver Top Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black She-oak (Allocasuarina littoralis). No database records occur within the locality.	N/A	N	N	N	N
Diuris arenaria Sand Doubletail	September	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	Y	Habitat Assessment Targeted Search Parallel Transects	September 22nd 2020	Marginally suitable habitat present within the Study Area as the species occurs in coastal heath and dry grassy eucalypt forest on sandy flats in gently undulating country in eucalypt forest with a grassy understorey on clay soil. No BioNet records within 5km locality.	N/A	N	N	N	N
Diuris praecox Rough Doubletail	August	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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	No suitable habitat present within the Study Area, the species grows on hills and slopes of near-coastal districts in open forests which have a grassy to fairly dense understorey. No database records within the 5km locality.	N/A	N	N	N	N
Eucalyptus camfieldii Camfield's Stringybark	All year	Parallel walking transects – Maximum distance between transects 40m in open, 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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	There is a small portion of this habitat present within the Development Area. The species is associated with poor coastal country in shallow sandy soils overlying Hawkesbury sandstone. The community is generally Coastal heath mostly on exposed sandy ridges. Two known records within the locality and occur north of Fullerton Cover near the Tilligerry SCA.	N/A	N	N	N	N
Eucalyptus parramattensis subsp. decadens	All year	Parallel walking transects – Maximum distance between transects 40m in open, 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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	Potentially suitable habitat within the Study Area as the species occurs in low-lying, often swampy areas and in woodlands with associates such as *Eucalyptus racemosa, E. globoidea and Angophora bakeri*, on poor sandy soils from either Pleistocene sands or Permian sediments. Low number of database records. Records occur within proximity of the Study Area.	N/A	N	N	N	N
Grevillea parviflora subsp. parviflora Small-flower Grevillea	August-November	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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	No suitable habitat within the Study Area The species prefers sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Also occurs in the Hunter in Kurri Sand Swamp Woodland. Hunter occurrences are usually 30-70m ASL.	N/A	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Lindernia alsinoides Noah's False Chickweed	November – February	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.	Y	Habitat Assessment Targeted Search Parallel Transects	November 17th 2020	Potentially suitable habitat within the Development Site as the species grows in swamp forests and wetlands along coastal and hinterland creeks. Recorded in coastal areas from Buladelah to Coopernook and with occurrences further north at Shannon Creek west of Coutts Crossing and also at Bungawalbyn..	N/A	N	N	N	N
Maundia triglochinoides	November – March	Search the appropriate parts of the water body by using a traverse coverage appropriate for the species' growth form.	Y	Habitat Assessment Targeted Search Parallel Transects in suitable habitat	November 17th 2020	Potential habitat within the Development Site due to standing water, however, heavy clay soils are not present.	N/A	N	N	N	N
Melaleuca biconvexa Biconvex Paperbark	All year	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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	Potentially suitable habitat within the Study Area as the species generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. No known records within the locality.	N/A	N	N	N	N
Melaleuca groveana Grove's Paperbark	All year	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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	No suitable habitat in Study Area as the species grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. It also occurs in dry shrubby open forest and woodlands. No number of known records within 5km locality.	N/A	N	N	N	N
Persicaria elatior Tall Knotweed	December - January	Targeted survey in suitable habitat including damp places, especially beside streams and lakes.	Y	Habitat Assessment Targeted Search Parallel Transects in suitable habitat	December 10th 2020	Marginal suitable habitat within the Study Area, the species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance.	N/A	N	N	N	N
Prostanthera densa Villous Mint-bush	All year	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.	Y	Habitat Assessment Targeted Search Parallel Transects	August 19th 2020	No suitable habitat in Study Area. This species has been recorded from the Currarong area in Jervis Bay, Royal National Park (Marley), Cronulla, Helensburgh and Port Stephens (Nelson Bay). *Prostanthera densa* generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea.	N/A	N	N	N	N
Pterostylis chaetophora Taree rustyhood	September– November	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.	Y	Habitat Assessment Targeted Search Parallel Transects	September 22nd 2020	Potential suitable habitat within the Subject Site and Study Area, with the preferred habitat is seasonally moist, dry sclerophyll forest with a grass and shrub understorey. No BioNet records within the vicinity.	N/A	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Rhizanthella slateri *Eastern Australian Underground Orchid*	September–November	Parallel walking transects – Maximum distance between transects 40m in open, 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	Y	Habitat Assessment Targeted Search Parallel Transects	September 22nd 2020	No suitable habitat for this species occurs within the Study Area. The species grows in eucalypt forest but no informative assessment of the likely preferred habitat for the species is available. Currently known only from 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	N/A	N	N	N	N
Tetratheca juncea Black-eyed Susan	September-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.	Y	Habitat Assessment Targeted Search Parallel Transects	September 22nd 2020	Potential habitat present within the Study Area. The species found in low open forest/woodland with a mixed shrub understorey and grassy groundcover. However, it has also been recorded in heathland and moist forest. However, no known records within locality.	N/A	N	N	N	N
Thesium australe Austral Toadflax	November-February	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.	Y	Habitat Assessment Targeted Search Parallel Transects	November 17th 2020	Marginal habitat present within the Study Area. The species occurs in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Habitat for this species includes grassland on coastal headlands or grassland and grassy woodland away from the coast.	N/A	N	N	N	N
Zannichellia palustris	October-January	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.	Y	Habitat Assessment Targeted Search Parallel Transects in suitable habitat	November 17th 2020	Potentially suitable habitat within the Study Area. The species is a submerged aquatic plant. Leaves 2-7cm long by less than 1mm wide. Grows in fresh or slightly saline stationary or slowly flowing water. NSW populations behave as annuals, dying back completely every summer.	N/A	N	N	N	N
Fauna											
Burhinus grallarius *Bush Stone-Curlew*	All year	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.	Y	August 20th, 24th & November 19th Spotlighting and call playback December 17th & 18th Meandering dusk and daw & 2-ha bird survey at 3 locations	August & November 2020	Marginal habitat present within the Study Area. The species inhabits open forests and woodlands with a sparse grassy ground layer and fallen timber. Low number of database records.	N	N	N	N	N
Calidris tenuirostris Great Knot	N/A	No survey required. The species is assessed for species credits via the Important Habitat Map in BOAMS. However it may have some foraging potential and significant amount of BioNet records, therefore the precautionary principal was undertaken to include in bird surveys.	Y	Meandering dusk and dawn bird census. December 17th & 18th 2-ha bird survey at 3 locations	December 2020	The habitat is not present within the Subject Site. The species prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. Typically, the Great Knot roosts in large groups in open areas, often at the water's edge or in shallow water close to feeding grounds.	N	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Callocephalon fimbriatum Gang-gang Cockatoo	October-January	Area based survey methods	Y	December 17th & 18th Meandering dusk and dawn bird census & 2-ha bird survey at 3 locations	August & November 2020	Marginal habitat present within the Study Area. The species prefers tall mountain forests and woodlands (particularly heavily timbered/mature wet sclerophyll forests) in spring and summer. In winter and autumn, the species moves to lower latitudes and occupies drier more open eucalypt forests and woodlands including dry forest in coastal areas and is often found in urban areas. No BioNet records within the vicinity.	N	N	N	N	N
Calyptorhynchus lathami Glossy Black-Cockatoo	April-August	Area based survey methods	Y	August 28th Morning bird census focusing on hollow-bearing trees December 17th & 18th Meandering dusk and dawn bird census & 2-ha bird survey at 3 locations	August 2020	Marginal habitat present within the Subject Site. The species feed almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina), and although *Casuarina glauca* was recorded within the Subject Site, no evidence of use nor any BioNet records within the vicinity.	N	N	N	N	N
Cercartetus nanus Eastern Pygmy-possum	October-March	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	Y	November 12th – 26th Remote cameras and spotlighting (November 19th)	November 2020	Marginal habitat present within the Subject Site. The species 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. Although Ban*ksia serrata* was recorded within the Subject Site, no evidence of use nor any BioNet records within the vicinity.	N	N	N	N	N
Crinia tinnula Wallum Froglet	All year	Combination of tadpole surveys, call surveys and nocturnal searches in suitable weather conditions around swamps, dams and flooded roadside ditches. Minimum of one 200-metre transect per water body or inundated area, repeated on a minimum of two separate nights. Total effort for a 500m transect (section of the riparian area that is located off site is approx 60m) is 480mins, repeated 4 times over 2 consecutive nights following 50ml of rain within a 48hr period.	Y	26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021 And by AEP 22 & 23/02/2023 Nocturnal spotlighting searches, stationary listening points and call playback. Reference population confirmed calling in PS LGA 15th December 2020. Walking transects were conducted on 10/12/2020 through areas of standing water and swamp vegetation, and areas adjacent to standing water.	October & December 2020, December 2021& February 2023.	Potentially suitable habitat in paperbark areas within the Subject Site and hydroline to the north. The Wallum Froglets 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. Low number of database records mostly situated north of Fullerton Cove.	N	N	N	N	N
Dromaius novaehollandiae - endangered population Emu population in the New South	All year	Area based survey methods.	Y	December 17th & 18th Meandering dusk and dawn bird census & 2-ha bird survey at 3 locations	December 2020	Potential habitat within the Subject Site as the species predominantly utilises 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.	N	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Wales North Coast Bioregion and Port Stephens local government area						They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest.					
Haliaeetus leucogaster White-bellied Sea-Eagle	July-December	Area based survey methods. Habitat assessment – 30 minutes searching each relevant habitat	Y	September 22nd Nest searches covering whole site December 17th & 18th Meandering dusk and dawn bird census & 2-ha bird survey at 3 locations	September & December 2020	Potential roosting habitat present within the Study Area. May fly over Subject Site but no large water bodies for use or suitable trees. This species hunts for fish, turtles and sea snakes however will feed on carrion along the waterline. The White-bellied Sea-Eagle most often nests in trees 30m above the ground. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Moderate number of database records, some in proximity to the Study Area.	N	N	n	N	N
Hieraaetus morphnoides Little Eagle	August-October	Habitat assessment – 30 minutes searching each relevant habitat. This matter has not been resolved as yet but it is likely that a species-time curve approach should be utilised for surveying diurnal birds. For example, the survey session for a particular day may cease when no additional species are identified within a set time period. This approach better accommodates the variety of habitat types and birds found in NSW. Per stratification unit.	Y	September 22nd Nest searches covering whole site	September 2020	Potentially suitable habitat for nest building within the Study Area but not within the Subject Site. The Little Eagle occupies open eucalypt forest, woodland, or open woodland. She-oak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Only one record within the locality from 2000.	N	N	N	N	N
Hoplocephalus bitorquatus Pale-headed Snake	November-March	Many diurnal reptiles are also sometimes active at night, particularly in the hour or two after sunset following warm days. Survey techniques for these species typically include searches using head torches or spotlights at night. Nocturnal spotlighting involves thoroughly searching suitable substrates for reptiles, using spotlights or head torches with a bright focussed beam. Many reptiles are detected primarily by their reflective eye shine. Suitable substrates are generally the ground, fallen logs and branches, rock outcrops and tree trunks, especially along roads and tracks.	Y	August 20th & 24th, November 19th, December 16th Spotlighting.	August, November & December 2020	It is highly unlikely this species will occur within the Subject Site, due to limited habitat conditions available. The Pale-headed snake occupies tree hollows (of which none are within the Subject Site) and found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Additionally, nocturnal surveys investigated the broader Study Area due to more suitable habitat for this species. Furthermore, this species has not been found within the IBRA or Sub IBRA of the Subject Site and therefore could be considered vagrant.	N	N	N	N	N
Litoria aurea Green and Golden Bell Frog	November-March	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	Y	26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021. And by AEP 22 & 23/02/2023	October & December 2020, December 2021&	No suitable breeding habitat present within the Study Area, the density of Typha and lack of open water reduces habitat suitability for the species. Limited suitable habitat present in hydroline to the north. The species inhabits	N	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
		approximately 1km per hour on 2 separate nights. Total effort for a 500m transect (section of the riparian area that is located off site is approx. 60m) is 480mins, repeated 4 times over 2 consecutive nights following 50ml of rain within a 48hr period.		Nocturnal spotlighting searches, stationary listening points and call playback.	February 2023	marshes, dams and stream-sides, particularly those containing bullrushes (*Typha spp*.) or spikerushes (*Eleocharis spp*.). Breeding habitat in NSW includes water bodies that are still, shallow, ephemeral, unpolluted (but the frog can be found in polluted habitats). Only 3 records of this species within the 5km locality in the last 10 years. Closest record is from 2011 and is greater than 2km in distance from the Subject Site.					
Litoria brevipalmata Green-thighed Frog	October-March	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. Total effort for a 500m transect (section of the riparian area that is located off site is approx. 60m) is 480mins, repeated 4 times over 2 consecutive nights following 50ml of rain within a 48hr period.	Y	26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021 And by AEP 22 & 23/02/2023 Nocturnal spotlighting searches, stationary listening points and call playback.	October & December 2020, December 2021& February 2023	Limited suitable habitat present within the Subject Site. The species are thought to forage in leaf-litter and for this Site it is only associated with PCT 1717 within the Subject Site which is in a poor condition and there are no BioNet records within a 5km radius of the Subject Site.	N	N	N	N	N
Myotis macropus Southern Myotis	October-March	16 nights with a minimum four nights of acoustic detectors, located in areas of greatest potential activity.	Y	December 7th – 11th Harp trapping and passive call recording (Anabat)	December 2020	No foraging or roosting habitat (hollow-bearing trees) exists within the Subject Site. Potential for foraging habitat occurs within the stream to the north of the Study Area. Southern Myotis (*Myotis macropus*) was identified within the Study Area but was not detected within the Subject Site. Suitable areas of foraging habitat (open waterbodies >3m diameter) are most likely the northern hydroline area outside of the Subject Site. As such, the species polygon includes all PCTs linked to the species within 200m from foraging habitat. The species polygon encompasses 2.25 ha of the Subject Site native vegetation proposed for removal and therefore credits will be applied. Refer **Figure 10.**	Y	Y	N	Y	Y
Petalura gigantea Giant Dragonfly	December-January	Surveys for the Giant Dragonfly from approx. 10am to 3pm, known times when the species is active. The survey included netting around sedges, rushes (aquatic vegetation). Dip netting into waterbodies to determine presence of larva. General visual observation and photos.	Y	December 10th Walking transects through suitable habitat	December 2020	The Study Area contains temporal habitat in the wetter months, with a small wetland area that has potential to contain this species. Although no known Bionet Records within the vicinity of the site and no visual observations during surveys, this species is unlikely to occur within this fluctuating habitat. Live in permanent swamps and bogs with some free water and open vegetation and although there is a dam within the Subject Site, it does not appear to be permanent nor open and suitable.	N	N	N	N	N
Petauroides volans	All year	Effort per stratification unit up to 50 hectares:	Y	November 12th -26th December 7th – 11th	August, November and	No suitable habitat is present within the Subject Site, however potentially suitable habitat exists within the Study Area. The species occurs in	N	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Greater Glider		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.		Fauna trapping (arboreal) and remote cameras Spotlighting transects undertaken on four separate nights (20/08/2020, 24/08/2020, 19/11/2020 and 16/12/2020)	December 2020	eucalypt forests a woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria. Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. No records within the locality.					
Petaurus norfolcensis Squirrel Glider	All year	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.	Y	November 12th -26th Fauna trapping (arboreal) and remote cameras December 7th – 11th Fauna trapping (arboreal) Spotlighting transects undertaken on four separate nights (20/08/2020, 24/08/2020, 19/11/2020 and 16/12/2020	August, November and December 2020	Marginal foraging and no denning habitat present within the Subject Site. The species inhabits mature or old growth Box, Box-Ironbark woodlands and *Eucalyptus tereticornis* (River Red Gum) forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstory. Require abundant tree hollows for refuge and nest sites which is present within Study Area. Low number of BioNet records with the closest record from 2011 approx. 750m east from the Subject Site.	N	N	N	N	N
Phascogale tapoatafa Brush-tailed Phascogale	December-June	Fauna Survey guidelines in the Threatened species database collection outline that survey must be undertaken using baited cameras. Cameras must remain in place for a minimum of 4 weeks with cameras checked and baits replaced after 2 weeks. A minimum of 4 cameras, independent of the size of the subject land, must be used for sites up to 1 ha, then an additional 2 cameras for every ha of suitable habitat thereafter. That is, at least 22 working, baited, evenly spaced camera traps are required for the first 10 ha of suitable habitat.	Y	November 12th -26th Fauna trapping (arboreal) and remote cameras December 7th – 11th Fauna trapping (arboreal) December 7th 2022 – 4th January 2023 - additional survey from PSC RFI camera trapping over minimum of 28 nights.	November and December 2020 and December 2022 – January 2023	Marginal foraging and breeding habitat within the Subject Site. The species prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. No known records within 5km locality.	N	N	N	N	N
Turnix maculosus Red-backed Button-quail	All year	Nocturnal surveys to flush birds from habitat should be used however identification is difficult and may require photos or handling individuals to distinguish from other more common species. Also important to note that call surveys including playback and songmeters not known to be effective as not known whether it responds, in what months it mostly calls, identification from button-quail species.	Y	November 19th Nocturnal survey. December 17 and 18th Meandering dusk and dawn bird census & 2-ha bird survey at 3 locations Spotlighting transects undertaken on four separate nights (20/08/2020, 24/08/2020, 19/11/2020 and 16/12/2020.	August, November and December 2020	Potential suitable habitat within Study Area where habitat conditions are relatively in good condition, in terms of grasslands and sedgelands and swamps. Historical clearing events possibly have this species avoiding the Subject Site with the likelihood of occurrence residing within the Study Area only. No BioNet records of this species exist within the vicinity, is unlikely to be found within the Subject Site.	N	N	N	N	N
Uperoleia mahonyi Mahony's Toadlet	October-March	Combination of tadpole surveys, call surveys and nocturnal searches in suitable weather	Y	26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021 And by AEP 22 & 23/02/2023	October & December 2020, December 2021&	Potential suitable habitat within Subject Site and on northern hydrolines. Known records are associated with shallow ephemeral/semipermanent water bodies with limited flow of water. Aquatic vegetation at	N	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
		conditions around swamps, dams and flooded roadside ditches. Minimum of one 200-metre transect per water body or inundated area, repeated on a minimum of two separate nights. Total effort for a 500m transect (section of the riparian area that is located off site is approx 60m) is 480mins, repeated 4 times over 2 consecutive nights following 50ml of rain within a 48hr period.		Nocturnal spotlighting searches, stationary listening points and call playback. Reference population in PS LGA confirmed calling 28/10/2020 & 15/12/2020.	February 2023	breeding sites includes sedges (*Schoenoplectus spp., Baumea spp. and Lepironia articulata*) and Broadleaf Cumbungi (*Typha orientalis*). Recent records are located north of Fullerton Cove.					
Lophoictinia isura Square-tailed Kite	September-January	Habitat assessment – 30 minutes searching each relevant habitat.	Y	September 22nd Nest searches covering whole site December 17 and 18 Meandering dusk and dawn & 2-ha bird survey at 3 locations	September and December 2020	Highly unlikely this species will occur within the Subject Site, due to their preferred habitats including dry woodlands and open forests. Although nesting sites are generally located along or near water courses of which the site experiences. The Subject Site has limited available resources in both reproduction and foraging for this species.	N	N	N	N	N
Ninox strenua Powerful Owl	May-August	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset.	Y	August 20th & August 24th Spotlighting, call playback and two nights stag watching one large hollow (>20cm diameter) at dusk adjacent to the Subject Site within the Study Area.	August 2020	Potential foraging and roosting habitat present within the Study Area. Previous assessments within the Study Area (Ecobiological, 2011) have recorded this species. The Powerful Owl was successfully detected on two (2) separate nights by Klienfelder within the Study Area through a call playback response. Call playback was broadcast from multiple locations surrounding the Study Area in attempts to determine location of the roost or nesting tree (if any). An individual Powerful Owl responded on two consecutive nights from a location to the north-east of the Study Area. The owl was observed to fly in from the east. Call playback was discontinued after the two nights as to limited disturbance to breeding behaviours. Following, multiple diurnal searches were undertaken within the approximate area the owl was observed flying from, however, the roosting location could not be identified. Given the minimal number of suitable size hollows (1 large hollow >20cm) within the Study Area, absence of signs of hollow use (individual was not detected through two nights of stag watching the large hollow) and directions owl flew in from, it is likely that roosting/nesting habitat is located outside of the Study Area. As a precaution, a 100m buffer has been mapped around the approximate location where the Owl was observed to have originated. The buffer does not overlap with any part of the Subject Site and therefore, no species polygon has been generated for this species nor species credits apply. Refer **Figure 9.**	N	Y	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Pandion cristatus Eastern Osprey	April-November	Habitat assessment – 30 minutes searching each relevant habitat. This matter has not been resolved as yet but it is likely that a species-time curve approach should be utilised for surveying diurnal birds. For example, the survey session for a particular day may cease when no additional species are identified within a set time period. This approach better accommodates the variety of habitat types and birds found in NSW. Per stratification unit.	Y	September 22nd Nest searches covering whole site December 17 and 18 Meandering dusk and dawn & 2-ha bird survey at 3 locations	September 2020	No suitable foraging habitat present within the Study Area. Potential for breeding habitat. The species favours coastal areas, especially the mouths of large rivers, lagoons and lakes. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. Low number of records, none in immediate vicinity to Study Area.	N	N	n	N	N
Ninox connivens Barking Owl	May-December	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset.		August 20th & August 24th Spotlighting and call playback and stag watch	August 2020	The Subject Site does not contain quality large old trees with hollows for nesting of which it requires. Some foraging potential on site but likely to occupy the Study Area resources. There are no BioNet records within the vicinity, unlikely to occur.	N	N	N	N	N
Phascolarctos cinereus Koala	All year	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.	Y	August 20th & 24th, spotlighting and call playback 19th November and 16th December nocturnal surveys One (1) SAT searches 17th November 2020 November 12th -26th remote cameras at 3m	Augus, November and December 2020	Suitable foraging habitat present within the Study Area. Moderate number of records with some in proximity to the Study Area with the closest record from 2015 located at the far end of the park on Seaside Boulevard, Fern Bay, 300 Metres SE from Nelson Bay Rd roundabout. The Study Area connects to larger areas of Koala foraging habitat. One *Eucalyptus robusta*, listed as a preferred Koala food tree under the Port Stephens CKPoM, occurs within the Subject Site. One small individual is disjunct from other vegetation and is largely surrounded by cleared land. Further assessment is addressed in the Port Stephens Council Comprehensive Koala Plan of Management (Port Stephens CKPoM) Refer **Appendix G**	N	N	N	N	N
Planigale maculata Common Planigale	All year	A dry pitfall consist of a container (tin, jar or drum) buried in the ground with its rim at surface level used to trap mobile animals that fall into it. With a 10m drift -fence between the two buckets (preferably 20l). Traps must be place for a minimum of four consecutive nights. With a	Y	December 7th – 11th Fauna trapping (terrestrial) was undertaken by Klienfelder. AEP December 7th 2022 – 4th January 2023 - additional camera trapping over 28 nights.	December 2020 (insufficient terrestrial trapping by Klienfelder). In 2023, unable to	Potential habitat within Study Area, minimal logs/shelter within Subject Site and managed area has been discounted as suitable habitat although species is associated with all PCT's on site. Only one record (2018), within the locality and close to the Study Area that was identified on BioNet records. The species polygon encompasses 1.28ha of the Subject Site native	N	N	N	Y	Y

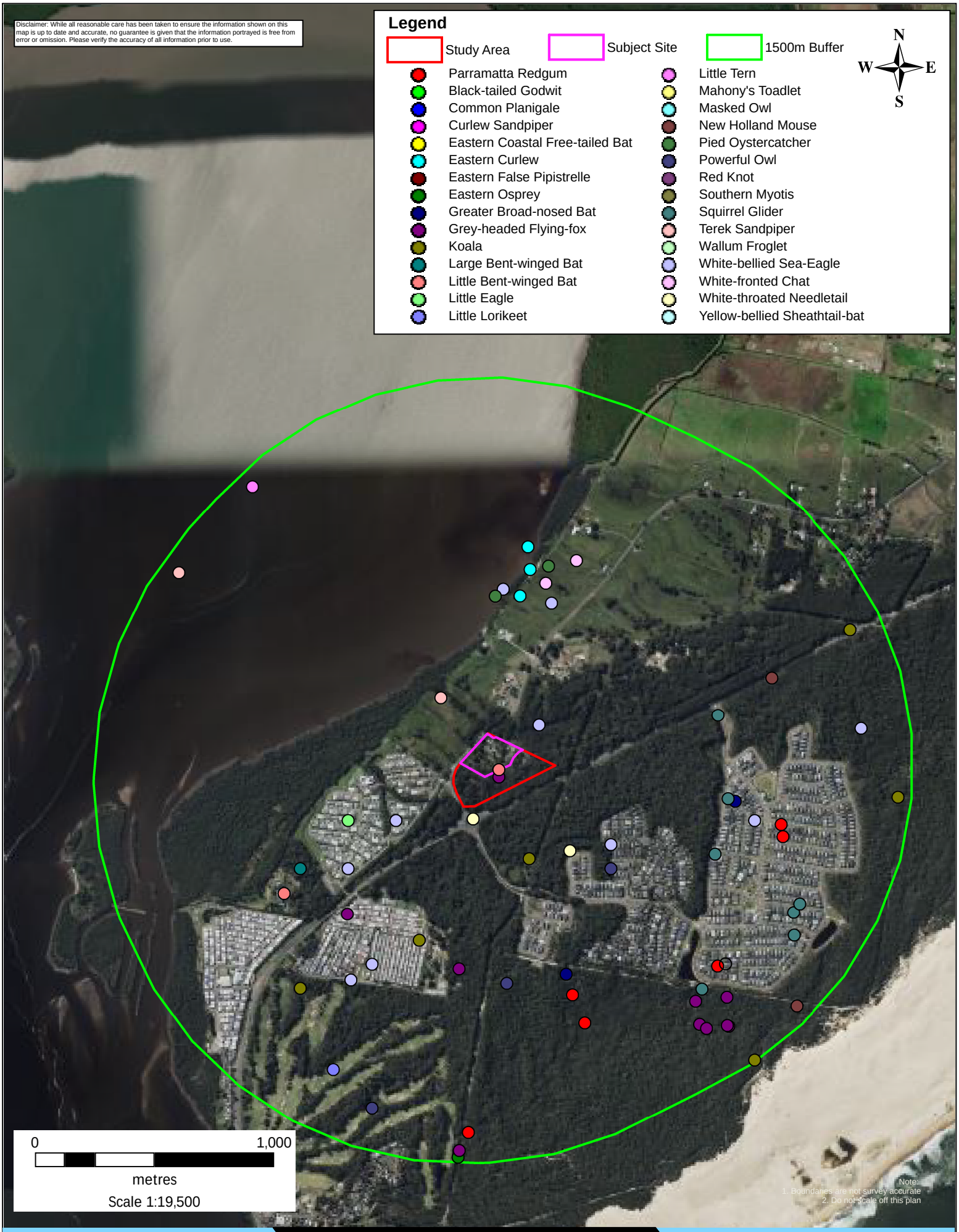
Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date Surveyed	Habitat (Present / Condition)	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
		minimum of three pitfall trap arrays for potential habitat up to 1ha and an additional 1 per additional ha.		Additional survey required from PSC RFI to survey within recommended survey guidelines of pitfall trapping. Camera trapping was not accepted, Planigale expert not available, heritage complications with burning required ahead of pitfall trap installation meant PSC recommended that 'assuming presence' was the best option for lodgement.	undertake pitfall trapping due to heritage complications.	vegetation proposed for removal and therefore credits will be applied. Refer **Figure 11.**					
Potorous tridactylus Long-nosed Potoroo	All year	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 BAM-C Survey Period: All Year.	Y	December 7th – 11th spotlighting, Fauna trapping (terrestrial) 12th-26th November at 1.5m	November & December 2020	Potentially suitable habitat within small section of the Development Site. The species inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. Better quality habitat exists within the Study Area. No BioNet records within the locality. This species is linked to PCT 1717 and requires assessment.	N	N	N	N	N
Tyto novaehollandiae Masked Owl	May-August	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated as follows: at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset.	Y	August 20th & August 24th Spotlighting and call playback	August 2020	Potential foraging and roosting habitat present within the Study Area with hollow bearing trees located outside of the Subject Site however the species prefers dry eucalypt forest and woodlands. Optimal habitat includes an open understory and a mosaic of sparse (grassy) and dense (shrubby) ground cover on gentle terrain. Three database records, with closest to site recorded in 2006.	N	N	N	N	N

Amphibian surveys were conducted between October and December, over two nights (26/10/2020 and 16/12/2020). Surveys were structured around rainfall events and warm nights and consisted of walking transects through suitable habitat (areas containing semi-permanent – permanent water bodies) with stationary listing points along the transect. Amphibians were identified through visual and aural detection. Additionally, a reference population of *Crinia tinnula* and *Uperoleia mahonyi* within the Port Stephens LGA were visited on 28/10/2020 and 15/12/2020 to confirm species were calling. Both *C. tinnula* and *U. mahonyi* were confirmed calling on 28/10/2020, while only *C. tinnula* was confirmed calling on 15/12/2020 at the reference site. It was identified by PSC following the Klienfelder rezoning BDAR that insufficient frog surveys were completed. AEP completed an additional round of frog surveys in February (22nd and 23rd) over two nights where the Williamstown weather station recorded 80.6mm and the Nobbys Beach weather station recorded 55.8ml.

Additionally, some of the threatened candidate species listed in **Table 18** have short flowering periods and therefore a narrow survey window. Reference populations for these threatened species were visited to confirm the species was in flower, allowing surveys to be conducted at times that give the best chance of detection. **Table 19** lists the threatened candidate species which had reference populations visited to confirm flowering.

Table 19 – Threatened flora species with short flowering periods assessed as part of the BDAR

Species	BAM survey period	Date of Survey	Date of reference population visit	Location of reference population	Species flowering at reference population
Corybas dowlingii Red Helmet Orchid	June-July	July 8th 2020	July 17th 2020	Soldiers Point, NSW	Yes
Cryptostylis hunteriana Leafless Tongue Orchid	November-January	November 17th 2020	November 14th 2020	Munmorah State Recreation Area, NSW	Yes
Diuris arenaria Sand Doubletail	September	September 22nd 2020	September 19th 2020	Nelson Bay, NSW	Yes
Diuris praecox Rough Doubletail	August	August 19th 2020	August 8th 2020	Crangan Bay, NSW	Yes
Pterostylis chaetophora	September - November	September 22nd 2020	September 10th, October 21st & November 14th 2020	Columbey National Park, NSW	Yes



AEP

Title: Figure 5 - Bionet Atlas Species Search

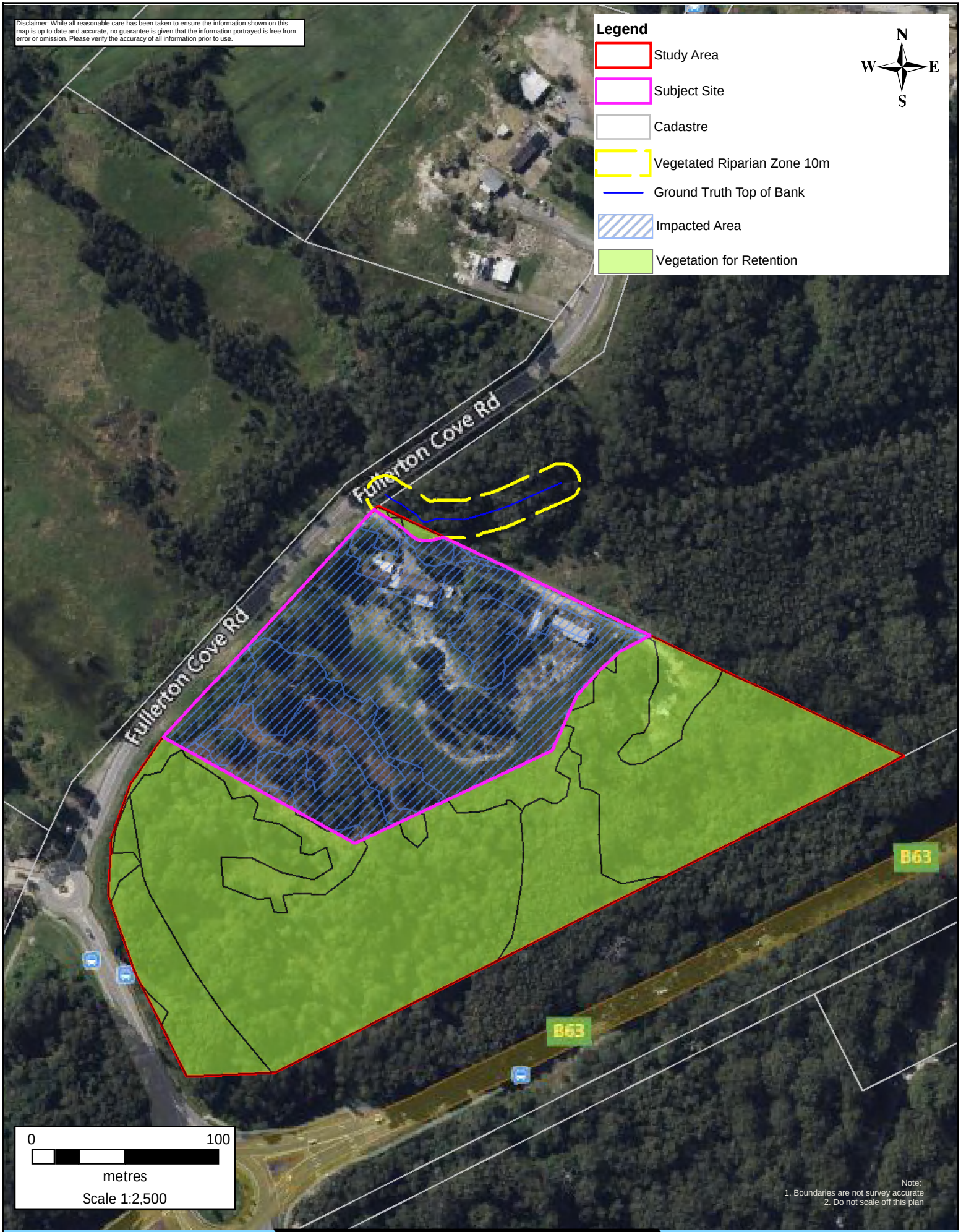
Date: Jan 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS: 36338

Client: Monteath and Powys

AEP Ref: 3063



AEP

Figure 6 - Impact and Retention Areas

Date: Jan 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS: 36338

Client: Monteath and Powys

AEP Ref: 3063

AEP

Title: Figure 7 - Flora Survey Effort

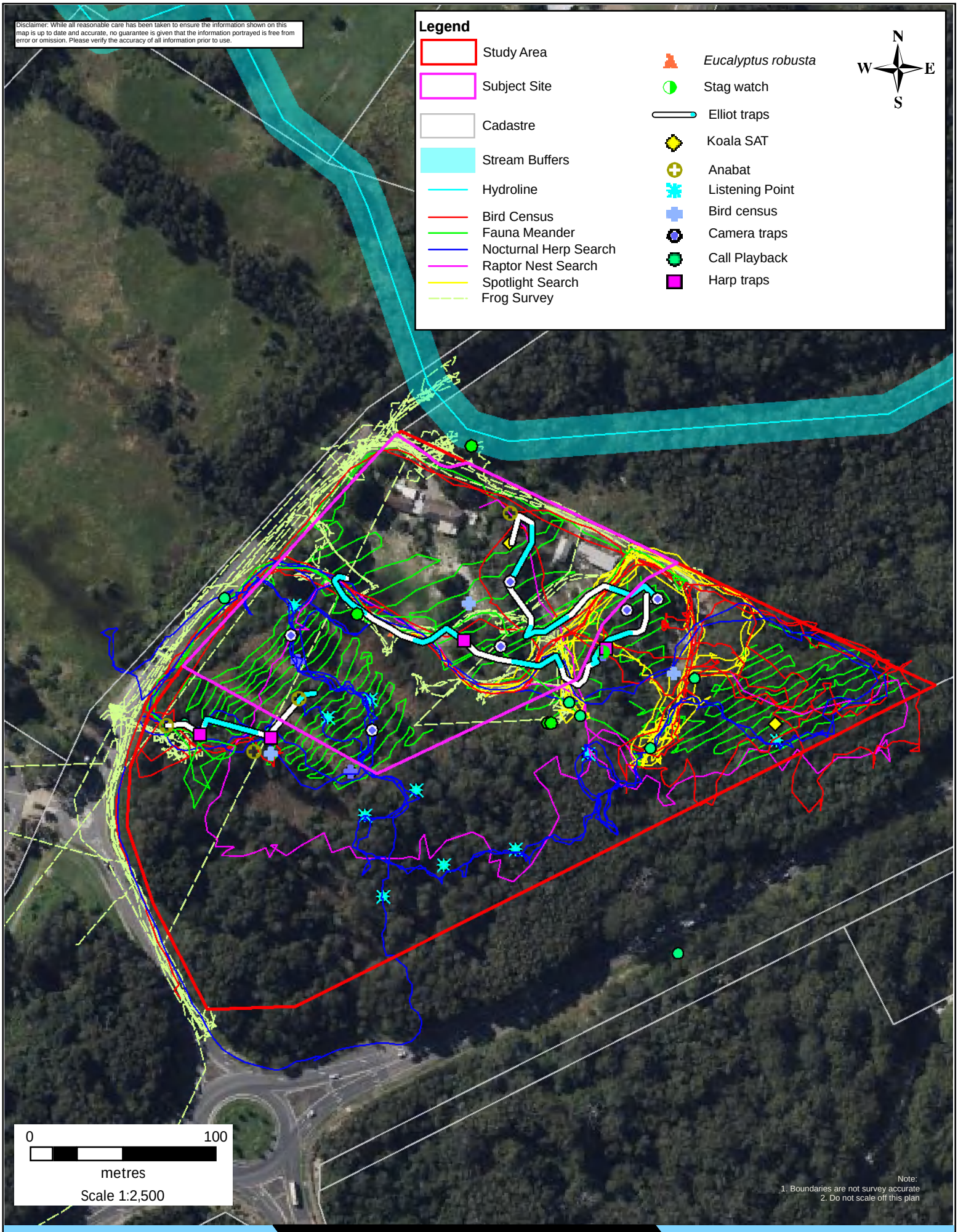
Date: Mar 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS Ref: 36338

Client: Monteath and Powys

AEP Ref: 3063



AEP

Figure 8 - Fauna survey effort

Date: Mar 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS Ref: 36338

Client: Monteath and Powys

AEP Ref: 3063

2.0 Stage 2 – Impact Assessment (Biodiversity Values)

2.1 Avoid and Minimise Summary

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.

The Avoid and Minimise strategy for the development (in accordance with Section 8 of the BAM), is discussed in greater detail in **Table 20** below.

The prescribed impact risk assessment and mitigation measures (in accordance with Section 9 of the BAM) are included in **Tables 20** to **27** 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 Impact Avoidance Measures

2.2.1 Project Design

The Development Footprint is the result of a design process which has sought to incorporate natural constraints and existing location in proximity to housing developments occurring within the Fullerton Cove/Stockton areas. It is located in an area which is already subject to disturbance with comparatively limited biodiversity and habitat value.

Areas of much higher value lie approx., <1km south at Worimi Regional Park and further north east in the Wormimi State Conservation Area and north in the Tillgerry State Conservation Area as well as the BV mapped area in the Hunter Wetlands National Park and surrounds.

A total of 4.24ha of higher quality native vegetation will be retained within the C2 Zoned lands which totals 4.40ha out of the entire allotment of 6.86ha. Of the retained area on site this equates to approximately 96% retention of native vegetation within the C2 zoned lands and an overall retention of more than half the native vegetation on site (62%). This clearly illustrates that the development is located within the most suitable, disturbed portion of the site.

To further demonstrate this;

- 1.42ha of PCT 1646 has a been classed with a Severely Degraded VIS and for this reason will not generate credits. This equates to approximately 58% of the Subject Site being located with Severely Degraded condition;
- A further 0.19ha (7%) of land has been identified as Non-native / Cleared / Existing Infrastructure;
- The land described above will not generate offset credits due to condition and equates to approximately 65%; and
- The remaining vegetation being classed as Poor to Moderate condition covers approximately 35% of the Subject Site.

Figure 6 shows areas of impacts and areas of vegetation retention in the context of the Study Area.

It is noted, the proposed development lies less than 400m south-east of Fullerton Cove which is part of the Hunter Estuary Wetlands RAMSAR site. It has been strongly recommended that the Stormwater Management Plan for the site be completed to the highest standard whereby the stormwater quality, erosion and sediment control and water sensitive urban design exceed council's baseline requirements and effectively reduces nutrients and gross pollutant output into the Hunter Estuary Wetlands.

2.2.2 Water quality and Hydrology

- An Erosion and Sedimentation Control Plan (ESCP) should be prepared for the proposal following guidelines from Landcom (2004), as well as a Stormwater Management Plan (SMP);
- Best practice erosion and sedimentation controls should be put in place to limit offsite movement of materials into the adjacent vegetation; and
- Erosion and sedimentation controls should be checked daily and maintained in working order especially after rain events.

2.2.3 Protection and Management of Retained Vegetation

- Preparation of Biodiversity Management Plan to ensure protection and enhancement of the retained C2 lands.
- Prior to construction commencing, the Project Ecologist will inspect the exclusion flagging tape alignment to ensure it adequately delineates the areas of retained trees and vegetation from the development footprint within the VRZ.
- No machinery or material is to be stored within retained vegetation or within the dripline of retained trees.
- Trees to be removed are to be felled in the opposite direction of the retained vegetation where possible.
- Effective weed control should be used on site, ensuring that appropriate methods are used to eliminate and dispose of high threat exotic weeds and highly competitive weeds.

2.2.4 Tree Management

- Tree Protection Zones need to be determined for any trees identified for retention within the development footprint to ensure suitable protection measures are in place.
- Landscape tree plantings should use species that are commensurate with the surrounding vegetation community where practical.

2.2.5 Fencing

No barbed wire is to be used within the Subject Site. Fencing within the Subject Site is to prevent incursions by fauna into the construction site; and following completion the industrial area of the development.

2.2.6 General Construction & Operation

Site specific Avoid and Minimise measures are discussed in **Table 20** and **Table 21**, while **Table 22** and **Table 23** outline the direct and indirect impacts associated with the development and how they are to be mitigated. The development's 'Avoid and Minimise' strategy (in accordance with Section 8 of the BAM), is discussed in greater detail in **Table 20** below.

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:

- For the clearing phase, retained vegetation located on the edges of the development footprint will be delineated by flagging tape, fencing and signage indicating an environmental protection zone. This will 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 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 (Phase 1, 2 and 3) are 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 are to be attended by a suitable equipped and experienced ecologist to deal appropriately with any displaced fauna species;
- 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 are to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection;
- 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;

- Plantings will be incorporated in the landscape design of the proposed development site to provide future resources for native fauna in the area;
- Implement hygiene protocols for machinery are to prevent the spread of weeds outside the development site;
- Best practice erosion and sedimentation (ERSED) and dust suppression control methods are to be adopted, monitored and maintained throughout any vegetation clearing works, particularly for downstream areas. Such are to be in accordance with “Soils and Construction – Managing Urban Stormwater” published by Landcom;
- Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise downstream hydrology changes; and
- Any bushfire protection measures in the form of Asset Protection Zones (APZs) or defendable space are to be incorporated within the development footprint to avoid requirements for additional vegetation removal in surrounding areas.

Table 20 – Avoid and Minimise Impacts on Biodiversity Values

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 proposed subdivision design is the result of an iterative process which has sought to avoid impacts to biodiversity values by preferring a location with lower biodiversity value as described above. A total of 4.24ha of higher quality native vegetation will be retained within the C2 Zoned lands which totals 4.40ha out of the entire allotment of 6.86ha. Of the retained area on site this equates to approximately 96% retention of native vegetation within the C2 zoned lands and an overall retention of more than half the native vegetation on site (62%). This clearly illustrates that the development is located within the most suitable, disturbed portion of the site. To further demonstrate this; • 1.42ha of PCT 1646 has a been classed with a Severely Degraded VIS and for this reason will not generate credits. This equates to approximately 58% of the Subject Site being located with Severely Degraded condition; • A further 0.19ha (7%) of land has been identified as Non-native / Cleared / Existing Infrastructure; • The land described above will not generate offset credits due to condition equates to approximately 65%; • The remaining vegetation being classed as Poor to Moderate condition covers approximately 35% of the Subject Site. The proposed design avoids areas of higher biodiversity value of remnant vegetation within the Study Area and the development footprint design is located primarily on cleared lands with vegetation in a highly disturbed form. Overall, the Study Area consists of 6.86ha with the Subject Site consisting of approx. 2.27ha, made up of four (4) PCTs in varying condition, as defined in the BioNet Vegetation Classification database, were identified within the Subject Site; • PCT 1646 – *Smoothbarked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* (Moderate) 0.01ha*;* • PCT 1646 – *Smoothbarked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* (Severely degraded) 1.42ha*;* • PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* (Poor/Managed) 0.11ha; • PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* (Poor) 0.46ha. This community forms part State listed TEC; Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and EPBC listed TEC; Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland and met the condition thresholds for this community; • PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* (Moderate) 0.007ha This community forms part of the Endangered Ecological Community (EEC) Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions. *and* • PCT 1737 – *Typha rushland* (Moderate) 0.27ha. This community forms part of the TEC Freshwater wetlands on coastal floodplains of the NSW North Coast/Sydney Basin and South East corner bioregions. The proponent has reviewed various options regarding the location and layout of the Project. The proposed Development Site has been selected to limit direct impacts to areas of intact native vegetation and is within a previously managed portion of the Study Area containing mostly planted and exotic vegetation. Areas of intact vegetation, current land use, location of approved developments, location of existing (or approved) roads and services and land zoning were all considered when selecting the location of the proposed development. The proposed location is accessible by an existing road (Fullerton Cove Road) which adjoins with Nelson Bay Road. As such, the use of this site was considered the best option to minimise environmental impacts. • The Study Area contains vegetation commensurate with three (3) State Listed Threatened Ecological Communities; • *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (PCT 1737); • *Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* (PCT 1728); and • *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* (PCT 1717). Overall, the Subject Site is highly degraded and contains 2 of these TEC's whilst the retained area occurs in poor to moderate condition. A very small area of a TEC will be impacted by the business signage. The proposal aimed to rezone approximately 2.32ha of vegetation commensurate with Swamp Oak Floodplain Forest EEC from *RU2: Rural Landscape* to *C2 Environmental Conservation*. Residual impacts to this EEC will be limited to areas of PCT 1717 that was rezoned to *B1: Neighbourhood Centre* (0.46ha). Impacts to Freshwater Wetlands EEC will be limited to 0.27ha within land that was rezoned to *B1: Neighbourhood Centre* (Subject Site). A total of 0.22ha will be retained as part of the rezoning of land from *RU2: Rural Landscape* to *C2 Environmental Conservation*.

Objectives/Requirements	Evidence of compliance
	Additionally, as part of the rezoning of land from *RU2: Rural Landscape* to *C2 Environmental Conservation*, moderate condition vegetation (PCT 1717) likely commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, will be retained. Retained vegetation containing good structural complexity, especially poor condition PCT 1717 and moderate condition PCT 1646, likely provides suitable foraging and potential roosting habitat for the Powerful Owl (*Ninox strenua*) a threatened species detected outside of the Subject Site during surveys.
Selecting a final proposal location may be an iterative process. Decisions may need to be revisited after all field surveys have been completed.	Surveys were undertaken on the basis of the proposed development design as shown in **Appendix A.** Once surveys were completed, it was confirmed that the proposed location to be developed was optimal considering the avoidance of higher quality vegetation and hollow bearing trees within the 4.40ha of the allotment being retained. The proposed development is considered to have minimal impacts to the biodiversity of the area in the context of the broader locality.
Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas: *a) lacking biodiversity values* *b) where the native vegetation or threatened species, habitat is in the poorest condition (i.e. areas that have a low vegetation integrity score)* *c) 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.* d) *outside of the buffer area around breeding habitat features such as nest trees or caves.*	a) As reflected in the Biodiversity Values Map, the Site is not mapped as containing biodiversity values mapped land. The current design has acknowledged the areas of higher biodiversity value and taken all practical opportunities to minimise development in these areas. The proposed location of the development proposal was chosen on the basis of its adjacency to the existing growth corridors within the Fullerton Cove area and its occurrence on disturbed land, with areas of higher biodiversity values being retained within the Study Area. b) The proposed development is located on areas primarily consisting of severely degraded PCT 1646 with a low VIS scores of 8.2 and 7.9 and with the remaining PCT's VIS scores indicating degraded and poor conditions. Comparatively a large portion of higher-value vegetation is being retained as described earlier. c) The Subject Site does not impact upon any habitat for species that have the highest biodiversity risk weighting as listed within the Guidance to assist a decision-maker to determine a serious and irreversible impact. The Subject DA Footprint does impact upon two TEC's in poor and moderate conditions (0.73ha) however significant good quality TEC's will be retained in the wider Study Area as indicated in **Figure 3**. d) No habitat features being used for breeding by known threatened species on site were identified. There is no area of important habitat mapped for the Regent Honeyeater, Swift Parrot, Plains-wanderer or Migratory Shorebirds identified within the site. No nest trees for threatened species were identified during the current assessment within the Subject Site. No caves or rocky outcrops are located on 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: *a) alternative modes or technologies that would avoid or minimise impacts on biodiversity values* *b) alternative routes that would avoid or minimise impacts on biodiversity values* *c) alternative locations that would avoid or minimise impacts on biodiversity values* *d) alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.*	a) Water Sensitive Urban Design will be implemented to minimise impacts on biodiversity values linked to hydrology and water quality. b) The location of the proposed routes when considering the existing road network and avoidance of areas of higher biodiversity value are considered to be optimal. c) The design process has sought to avoid most areas of higher biodiversity values located in the remaining area of the allotment. The proposed Subject Site is located in an area where the majority of VISs are low and predominately comprise of previous cleared lands d) As mentioned previously, most areas within the allotment of higher biodiversity value are being avoided and the proposed Subject Site is located in an area which contains the lowest level of biodiversity values throughout the Study Area.
The proposal may also list and map site constraints, such as: *a) bushfire protection requirements, including clearing for asset protection zones* *b) flood planning levels* *c) servicing constraints.*	a) Asset Protection Zones (APZs) have been recommended for the site and have been incorporated into the design process and included within the Subject Site. b) Storm water management and Water Sensitive Urban Design has been considered and incorporated as part of the development. Refer to the Flooding & Stormwater Management Plan prepared by Northrop Sept 2023 (refer **Appendix I**) for flood planning levels and associated works. Detention basins have also been incorporated within the site design, a Controlled Activity Approval has been requested and any encroachment within the outer 50% of the Vegetated Riparian Zones (VRZs) for the identified first order stream in the northern adjacent allotment, have all been offset/incorporated into the design within the development footprint along the relevant streams as required as part of the riparian corridor management. The development causes only marginal increase in time of inundation over various depth thresholds (2 hour for the 1% AEP and up to 10 hours for the 10% AEP over 500mm) when it occurs into the Swamp Oak or Typha (wet area plant communities – PCT 1728, 1737 as indicated in the model below.

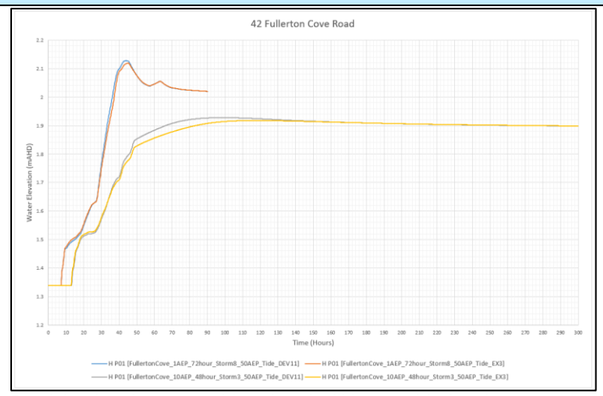
Objectives/Requirements	Evidence of compliance
	 c) Servicing has been considered and will be provided to the property.
In the BDAR or BCAR, the assessor must document and justify any actions taken to avoid or minimise impacts through careful location of the proposal.	As detailed above, the final development footprint is the only feasible option to enable the project to progress. Considering the location of the development footprint in the context of the Study Area, it has the least impact to biodiversity values, native vegetation, connectivity routes and fauna movements whilst still being located on appropriately residential and industrially-zoned land which has access to services.
Designing a Project to Avoid and Minimise Impacts on Native Vegetation and 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: *a) Reducing the proposal's clearing footprint by minimising the number and type of facilities* *b) Locating ancillary facilities in areas that have no biodiversity values* *c) 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)* *d) 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)* *e) 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) The proposal has been designed to follow the principles of avoid and minimise by utilising the lower quality cleared land that continues to be partly managed. b - d) All infrastructure required for the Subject Site has been designed either within areas already required to be cleared as part of roads or to avoid as much native vegetation as possible. e) Appropriate protection measures during and after construction, including fencing will be implemented to avoid any impacts to adjacent areas of higher biodiversity value.
The BDAR or BCAR must document and justify efforts to avoid or minimise impacts through design.	Details of proposed avoidance and minimisation measures are provided in **Tables 20-25**.

Table 21 – Prescribed Impact Avoidance and Minimisation

Objectives/Requirements	Evidence of compliance
Avoiding and Minimising Prescribed Biodiversity Impacts during Project Planning	
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.	No biodiversity values in addition to those noted in the BDAR i.e., direct and indirect impacts to biodiversity were identified for the Subject Site. Direct and indirect impacts are considered in **Tables 22 to 25** of the BDAR.
Locating a Project to Avoid and Minimise Prescribed Biodiversity Impacts	
To avoid or minimise prescribed biodiversity impacts, the proponent must consider how to: *a) Locate surface works to avoid direct impacts on the habitat features identified in Chapter 6* *b) 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* *c) 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* *d) Optimise the proposal layout to minimise interactions with threatened entities; for example, design a wind farm that has:* *i. 100 m turbine-free buffers around features that attract and support aerial species, such as forest edges, riparian corridors, wetlands, ridgetops and gullies* *ii. turbine-free corridors in zones of regular movement for species of concern, to avoid a barrier effect* *e) locate the proposal to avoid impacts on water bodies or hydrological processes*	a) The Subject Site: i. Does not contain karsts, caves, crevices, cliffs. Present within the site are areas containing abundant small rocks and boulders and boulder piles. These areas will predominantly be retained except for one area of boulders that have been subject to disturbance by manually being heaped together in a pile. No other features of geological significance supporting threatened species and ecological communities are present; ii. Does contain rocks as discussed above, which may support habitat for threatened species; iii. Contains human made structures. However, no evidence of use by microbats was found on site.; iv. Does not contain non-native vegetation supporting threatened species but threatened ecological communities present; v. Wind turbines are not a feature of the development proposed. vi. Given that the development will be for local roads with a maximum speed limit of 50km/hr, the likelihood of vehicle strike is considered much lower than higher speed roads. b) No sub-surface work is expected as a result of the proposed development. c) The land on which the development is proposed would only provide connectivity between different areas of habitat for highly mobile species as the site is fragmented from other areas of vegetation. The significant area of retention within the Study Area will continue to provide habitat and connectivity to highly mobile species. d) Discussed above. e) A first order watercourse is mapped outside of the Subject Site and located to the north in the adjoining allotment. Any further impacts to wetland TEC's and incorporation of flood planning modelling for the site have been considered. The Flooding & Stormwater Management Plan prepared by Northrop Sept 2023 (refer **Appendix I**), indicates that the proposed development will achieve a significant reduction in pollutant loads hence improving the water quality throughout the catchment area. The modelling in the Water Management Plan shows: • *"Gross pollutants will achieve an 99.6% reduction* (exceeds Port Stephens Council requirements); • *Total Suspended Solids will achieve 90.9% reduction* (exceeds Port Stephens Council requirements); • *Total Phosphorus will achieve 66.7% reduction* (exceeds Port Stephens Council requirements); and • *Total Nitrogen will achieve 55.4%* (exceeds Port Stephens Council requirements). The Stormwater Management Plan prepared by Northrop September 2023, concludes that t*he proposed Stormwater Management Strategy is considered to effectively meet the objectives of the PSC's DCP. It was concluded that the proposed development will not create any significant adverse impacts to flood behaviour on the subject site and on the properties surrounding the subject site. Furthermore, flood risk in the developed case has been adequately managed through the selection of floor levels, driveway access levels, and flood compensatory cut.*
When locating a proposal, the following need to be analysed and justification should be provided for each alternative selected: *a) alternative modes or technologies that would avoid or minimise prescribed impacts* *b) alternative routes that would avoid or minimise prescribed impacts* *c) alternative locations that would avoid or minimise prescribed impacts* d) *alternative sites within a property on which the proposal is located that would avoid or minimise prescribed impacts.*	a) Given the small size of the proposed impact area on native vegetation (2.27ha) and the fact that the development is located within cleared or disturbed vegetation, it was not considered practical to assess alternative modes or technologies to avoid and minimise impacts to biodiversity on site. Water Sensitive Urban Design will be implemented to minimise prescribed impacts on biodiversity values linked to hydrology and water quality. b) The proposed development will be utilising part of existing routes into the site and will have minimal impacts to native vegetation. Further to this, no prescribed impacts are expected, with higher value habitat such as streams and remnant vegetation being retained. c) The development footprint was considered to be the most appropriate due to the location and quality of areas of remnant native vegetation. Alternative locations would have led to higher impacts on biodiversity and as such, the current location is considered to be optimal in the context of the parent lot. d) Discussed above.
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: *a) bushfire protection requirements, including clearing for asset protection zones* *b) flood planning levels* *c) servicing constraints.*	a) AEP is given to understand that all required asset protection zones (APZs) and defendable spaces are contained within the proposed Subject Site. b) AEP is given to understand that flood planning levels and servicing constraints have been considered and the proposal has met the required standards. c) Access and services will be provided via existing carriageways and infrastructure with improved modifications due to rezoning.

Objectives/Requirements	Evidence of compliance
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.	Discussed above.
Designing a Project to Avoid and Minimise Prescribed Biodiversity 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* *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* *c) Maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation* *d) Maintaining hydrological processes that sustain threatened entities* *e) Controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities.*	a) i. It is not envisaged that any works will impact on features of geological significance, groundwater dependent communities or supporting aquifers. ii. An area of retained lands within the allotment has been designated along the southern and western boundary of the Subject Site which should ensure that current connectivity is maintained. b) It is recommended that powerlines be buried rather than overhead so that flight paths for threatened fauna in the locality are maintained and avoid impacts such as powerline strike. A rural style 'post and rail' fence placed at the edge of the proposed development is recommended along with a low-speed limit within the development will mean that even if animals enter the Subject Site, they are unlikely to be struck by vehicles. Native species have been recommended to be incorporated into the landscape design process. c-d) The Flooding & Stormwater Management Plan prepared by Northrop Sept 2023 (refer **Appendix I**), indicates that the proposed development will achieve a significant reduction in pollutant loads hence improving the water quality throughout the catchment area. The modelling in the Water Management Plan shows: • *"Gross pollutants will achieve an 99.6% reduction* (exceeds Port Stephens Council requirements); • *Total Suspended Solids will achieve 90.9% reduction* (exceeds Port Stephens Council requirements); • *Total Phosphorus will achieve 66.7% reduction* (exceeds Port Stephens Council requirements); and • *Total Nitrogen will achieve 55.4%* (exceeds Port Stephens Council requirements). The Stormwater Management Plan prepared by Northrop September 2023, concludes that t*he proposed Stormwater Management Strategy is considered to effectively meet the objectives of the PSC's DCP. It was concluded that the proposed development will not create any significant adverse impacts to flood behaviour on the subject site and on the properties surrounding the subject site. Furthermore, flood risk in the developed case has been adequately managed through the selection of floor levels, driveway access levels, and flood compensatory cut.* e) The project design process incorporates MUSIC (Model for Urban Stormwater Improvement Conceptualisation) water quality modelling to determine stormwater treatments to ensure post-development water quality at least maintains pre-development conditions.
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 or presence has been assumed. The development has been designed to follow the principles of avoid and minimise by utilising cleared and degraded land where possible. Refer to Section 2.1of the BDAR.

2.3 Assessment of Impacts

Section 8 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. **Tables 22** to **25** provide a summary of measures proposed to avoid and minimise direct, indirect, prescribed and residual impacts on biodiversity.

Table 22 – Direct Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Native vegetation	Construction and Operation	The Study Area consists of 6.86ha and the Subject Site is a total area of 2.46ha. 2.27ha of native vegetation will be impacted including potential habitat for 20 ecosystem credits.	The location of the proposed subdivision is such that extensive areas of remnant native vegetation will be retained within the allotment (4.24ha). Landscaping within the development will utilise endemic native species suitable for future fauna use.	Operation and Post-operation	Council Project coordinator	HR	MR
Habitat in the form of tree hollows	Pre-Construction and Construction	Removal of tree hollows providing habitat for native birds and mammals is not expected. None recorded within the Subject Site or expected to be impacted at this stage.	If hollows area identified during the clearing process they will be replaced at a ratio of 2:1 with salvaged hollows and/or nest boxes in order to ensure no net loss of hollow resources. Nest boxes are to be installed in retained habitat within the site. Nest boxes are to be installed by qualified ecologists and according to the Habisure system (Franks & Franks 2006) or similar. However, no HBT's have been recorded within the Subject Site.	Pre-Construction	Project coordinator Project Ecologist	HR	MR
Fauna home range and connectivity	Pre-Construction and Construction	Disturbance to fauna habitat during pre-operation clearing and construction.	Installation of a fauna-protecting fence, including relevant signage, to create a fauna protection zone which coincides with the tree protection zone. A permanent fence should be installed once construction of the new development is complete.	Pre-, during and post-operation	Project coordinator Construction staff Site manager Project Ecologist	HR	LR
Fauna home range and connectivity	Operation	Reduction in connectivity	No additional reduction in connectivity is proposed within the development due to connectivity already being very limited within the Subject Site. The Study Area includes retained vegetation that will continue to provide connectivity to highly mobile species post development. It is recommended that landscaping include native species commensurate with the local vegetation communities within the Subject Site.	Pre-, during and post-operation	Council Project coordinator Ecologists	MR	LR
Reduction of biodiversity values	Pre-Construction, Construction and Operation	Damage to retained trees	Installation of a fence as per the item above, including relevant signage, to create a tree protection zone where relevant. 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.	Pre- and during-operation	Project coordinator Construction staff Site manager Project Ecologist	HR	LR
	Construction	Sediment run-off into retained vegetation area	Best practice erosion and sedimentation (ERSED) control methods to be adopted, enforced and maintained throughout vegetation works, so as to avoid any movement of sediment resulting from clearing and construction into the retained vegetation lands. Where practical, clearing and excavation will be restricted to drier periods.	During development	Project coordinator Construction staff Site manager Project Ecologist	MR	LR
		Change in stream flow and structure	Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise hydrology changes.	During development and Operational	Project coordinator Construction staff Site manager Project Ecologist	MR	LR

Table 23 – Prescribed Impact Assessment

Subject of Prescribed Impact	Project Phase	Mitigation	Timing	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	Human-made structures are present on site. However, no evidence of use by threatened species was identified. No other features of geological significance supporting threatened species and ecological communities are present;					
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Construction and operation	No additional reduction in connectivity is proposed within the development due to connectivity already being very limited. The proposed development includes retained vegetation within the allotment that will continue to provide connectivity to highly mobile species post development.	Pre-operation and operation	Council Project coordinator Project Ecologist	MR	LR
Movement of threatened species that maintains their lifecycle	Construction and operation	Vegetation clearing and resulting habitat clearing are unlikely to affect movement of threatened species due to the absence of evidence of site use by such species. Retention of native vegetation will continue to support connectivity for highly mobile species	Pre-operation and operation	Council Project coordinator Project Ecologist	MR	LR
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	Construction and operation	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.	Pre-operation and operation	Project coordinator 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 precinct's roads.	Pre-operation and operation	Project coordinator Construction staff Site manager Project Ecologist	HR	MR

Table 24 – Indirect Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Noise	Pre-operation and Construction	Noise during construction due to clearing works and related vehicular traffic. Potential disturbance to threatened species or reduced viability of adjacent retained habitat zone.	Timing of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP) which will include a Noise Mitigation Plan.	Pre-operation and Operation	Project coordinator Construction staff Site manager	HR	MR
	Operation	Noise due to traffic. Potential disturbance to threatened species within the surrounding area.	Suitable fencing to be installed and maintained between development and retained lands to prevent access and reduce potential interaction with threatened species. Standard residential and carpark speed limits in commercial developments should apply which would limit traffic noise.	During operations and Operational	Civil Contractor	MR	LR
Vibration	Construction	Disturbance to fauna which may lead to displacement to adjacent areas.	Conditions of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP).	During construction	Project coordinator 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.	Dust levels during operations managed according to an approved CEMP: • Daily monitoring of dust generated by construction activities; and • Dust suppression measures (setting maximum speed limits and application of dust suppressants) will be implemented during construction works to limit dust on site.	During construction	Project coordinator Site manager Construction staff	LR	LR
Light spill	Construction	Disturbance to nocturnal fauna, thus reducing viability of the adjacent habitat.	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 vegetated lands. Light-sensitive threatened species are unlikely to occur on site but should be considered in the adjoining C2 lands. This includes the illumination of the proposed signage with C2 lands.	During construction	Project coordinator Site manager Construction staff	LR	LR
	Operation	Disturbance to nocturnal fauna, thus reducing viability of adjacent retained habitat zone.	Provision of lighting will be in accordance with an approved CEMP. Permanent lighting shall be designed to minimise light spill into surrounding vegetation.	During operations	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.	As per an approved CEMP: • 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; and • Chemical and manual treatment of weeds where applicable.	During construction	Project coordinator Site manager Construction staff	MR	LR
Visual amenity	Construction	Rubbish and waste retained onsite attracting native fauna.	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.	During construction	Project coordinator Site manager Construction staff	LR	LR
	Operation	Rubbish and waste retained onsite attracting native fauna.	Suitable fencing to be installed and maintained between development and surrounding natural areas to deter access and degradation of retained lands.	During operations	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 2.27ha of native vegetation	The Subject Site has been located so as to avoid most areas of higher biodiversity values. It is therefore considered to be situated in an optimal part of the parent lot.	PCT 1646 (severely degraded) – 1.42ha PCT 1646 (moderate) – 0.01ha PCT 1717 (poor/managed) – 0.11ha PCT 1717 (poor) – 0.46ha PCT 1728 (moderate) – 0.007ha PCT 1737 (moderate) – 0.27ha	Yes
		Removal HBTs with potential for use by fauna is not required.	Installation of nest boxes, as well as any recovered hollows in the Subject Site is not required at this stage but if found they are to be installed within retained lands in the broader parent lot.		Yes
Noise, dust, light spill	Pre-operation and Operation	Disturbance to local fauna	Application of CEMP 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

Table 26 – 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 27 – Assessment Criteria

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)

2.4 Summary of Potential Impacts on Biodiversity

2.4.1 Prescribed Impacts Requiring Offsetting

No prescribed impacts are relevant to the Subject Site.

2.4.2 Vegetation Clearance Requiring Offsetting

The development would result in the loss of approx. 2.27ha of native vegetation. The future Vegetation Integrity Scores will be zero for all areas.

The BAM Calculator valued the loss of 2.27ha consisting of PCT 1646 (moderate) at 1 Credit, PCT 1717 (poor) at 8 credits, PCT 1717 (poor/managed) at 2 credits, PCT 1728 (moderate) at 1 credit and PCT 1737 (moderate) at 8 credits giving a total of 20 Ecosystem Credits.

2.4.3 Species Credit Species

As described previously, the following species have been assumed present and therefore credits will be applied:

- Southern Myotis; and
- Common Planigale.

Assumed presence has been made at this point for the Common Planigale due to conditions relating to heritage issues around pitfall trapping as the preferred survey method for this species.

Refer to **Table 29**.

2.4.4 Vegetation Clearance Not Requiring Offsetting

Vegetation clearance not requiring offsetting includes 0.19ha of residential dwellings, sheds, infrastructure and access tracks and 1.42ha of PCT 1646 Severely Degraded which has a VIS score lower than 17.

2.4.5 Impacts requiring offset

2.4.5.1 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 of the BAM. 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 twenty (20) ecosystem credits are required to offset the proposed development. Impact areas requiring offset are shown in **Figure 6**.

Table 28 – Ecosystem Credit Requirements

Vegetation Zone	Condition	Impact Area (ha)	Future VIS	Vegetation Integrity Score Loss	Biodiversity Risk Weighting	Credit Requirements
PCT 1646	Severely degraded	1.42	-	7.7	1.5	0
PCT 1646	Moderate	0.01	-	57.9	1.5	1
PCT 1717	Poor/Managed	0.11	-	36.4	2.0	2
PCT 1717	Poor	0.46	-	35.5	2.0	8
PCT 1728	Moderate	0.01		61.5	2.0	1
PCT 1737	Moderate	0.27	-	37.4	2.0	8
Total		**2.27**	**-**	**-**	**-**	**20**

Discrepancies in areas due to rounding for the BAM-C

2.4.5.2 Species Credits

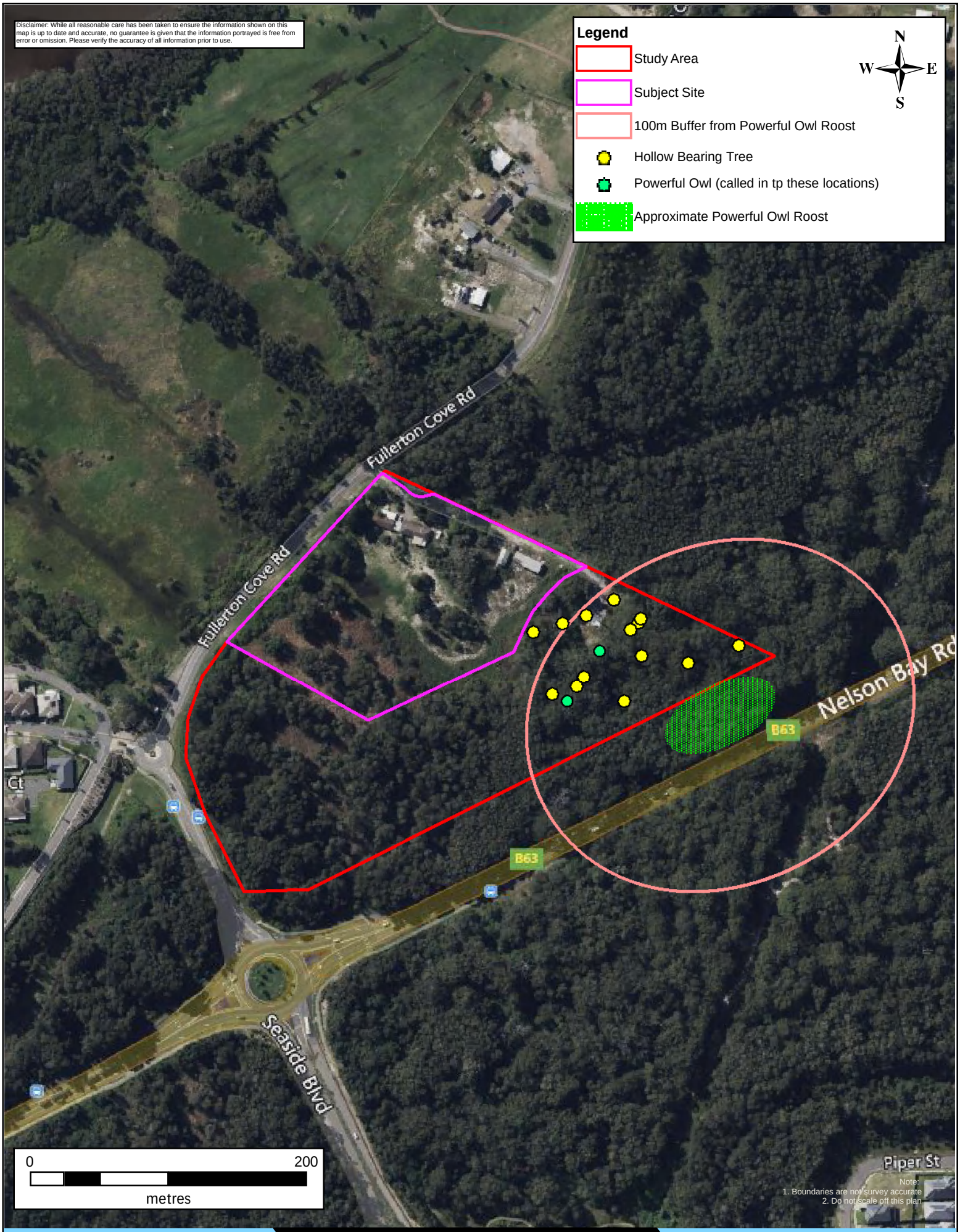
If a Species Credit species is either identified on the site during survey, assumed to be present, or confirmed present within an expert report, a 'species polygon' is required to be produced for the area of suitable habitat within the site for the species. The size of this polygon is entered into the 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. Refer **Figure 9** for the 100m buffer for Powerful Owl for reference and **Table 29** with the following species credit requirements and species polygons; **Figure 10** Southern Myotis and **Figure 11** Common Planigale.

Table 29 –Species Credit Requirements

PCT and condition	Impact Area (ha)/count	Biodiversity Risk Weighting	Credit Requirements
Common Planigale			
1646 (Severely degraded)	0.67	2	3
1646 (Moderate)	0.01	2	1
1717 (Poor/Managed)	0.09	2	2
1717 (Poor)	0.34	2	6
1728 (Moderate)	0.01	2	1
1737 (Moderate)	0.16	2	5
Total credits required Common Planigale			**18**
Southern Myotis			
1646 (Severely degraded)	1.4	2	5
1646 (Moderate)	0.01	2	1
1717 (Poor/Managed)	0.11	2	2
1717 (Poor)	0.46	2	8
1737 (Moderate)	0.27	2	8
Total credits required Southern Myotis			**24**
Total species credits required for Subject Site			**42**

2.5 Biodiversity Credit Report

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

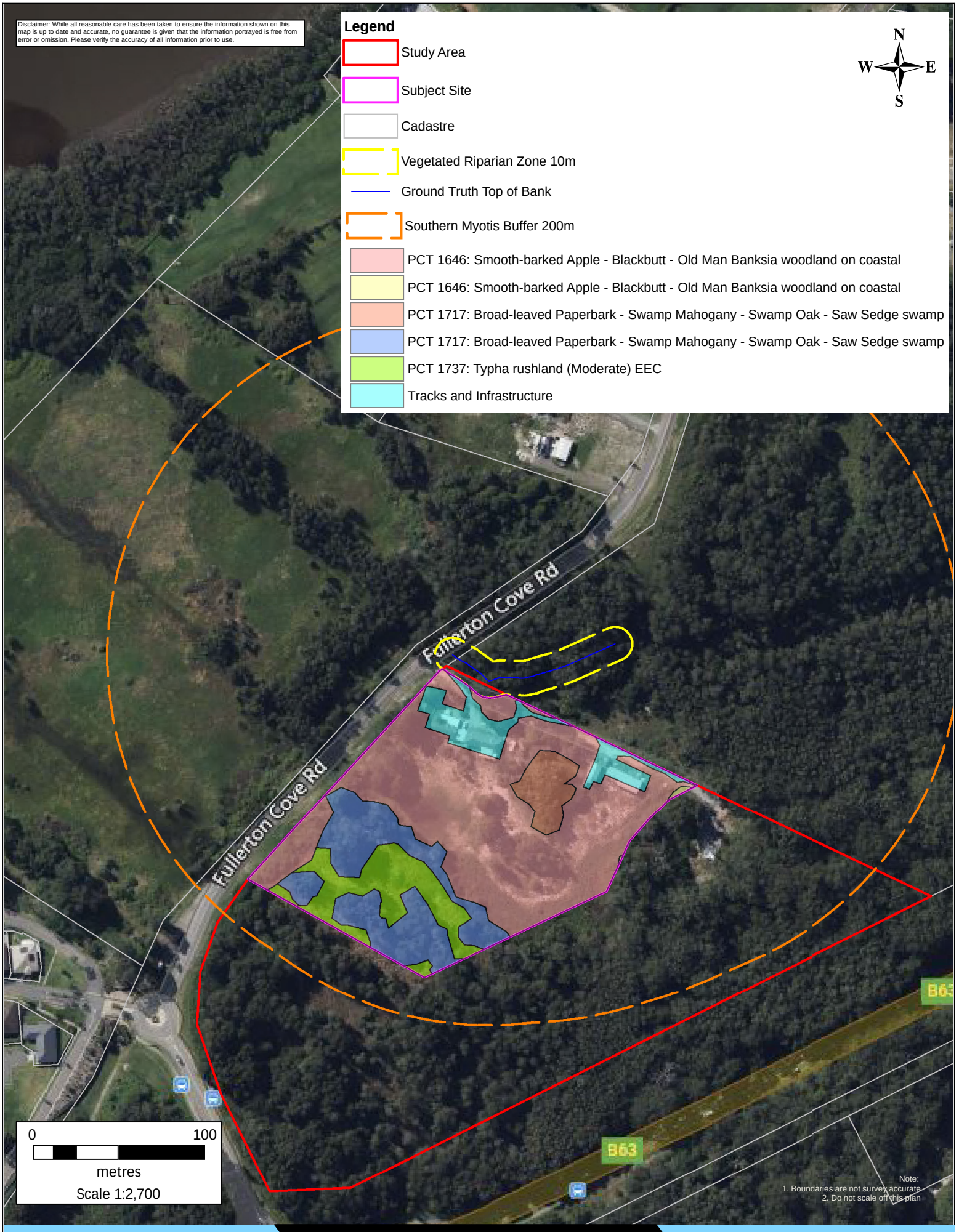


AEP

Figure 9 - Powerful Owl Species Polygon | Date: Jan 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW | BOAMS: 36338

Client: Monteath and Powys | AEP Ref: 3063



AEP

Figure 10 - Southern Myotis polygons

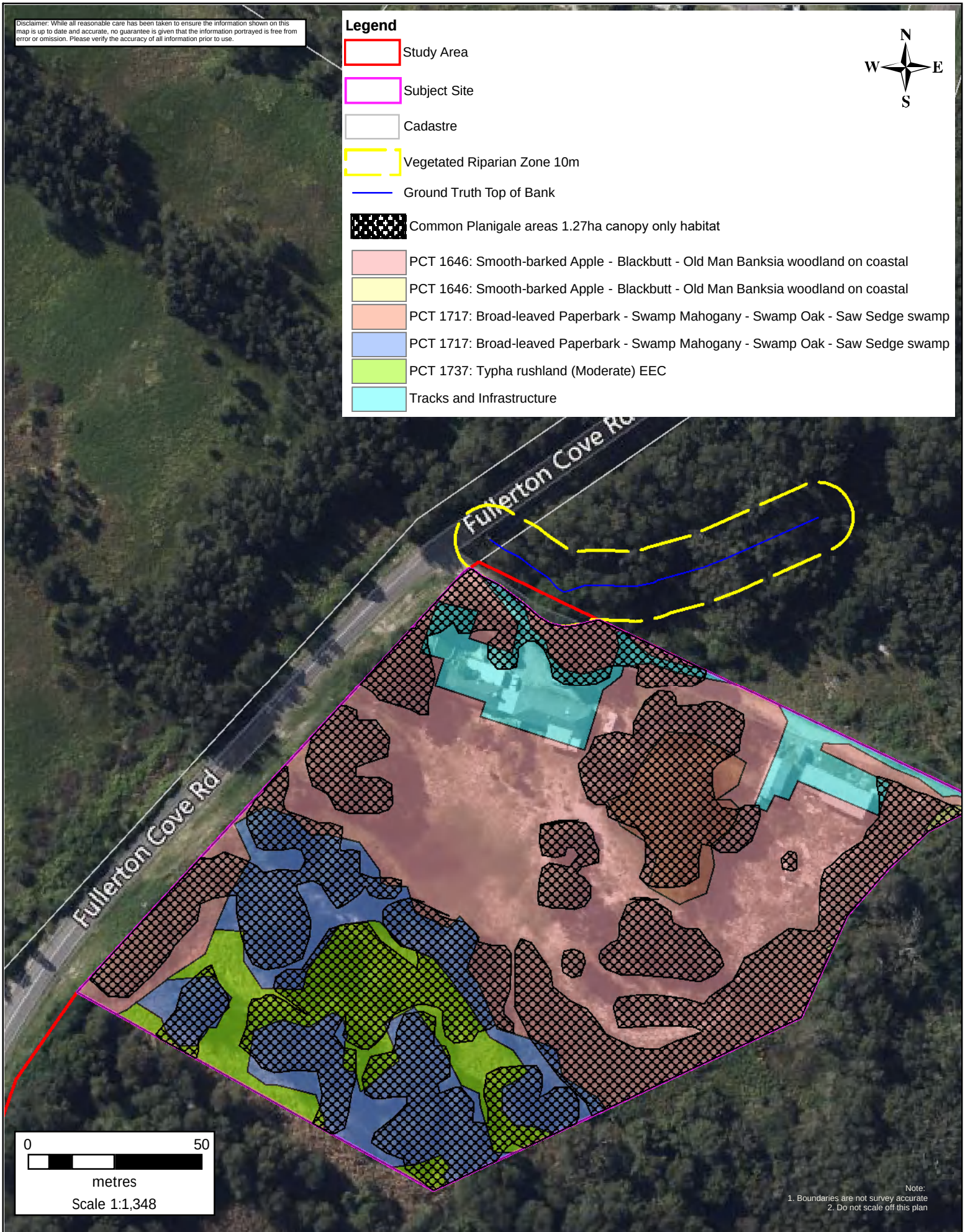
Date: Feb 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS: 36338

Client: Monteath and Powys

AEP Ref: 3063



AEP

Figure 11 - Common Planigale areas

Date: Feb 2023

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS: 36338

Client: Monteath and Powys

AEP Ref: 3063

AEP

Figure 12 - Proposed Business Signage Location

Date: Aug 2023

Location: 42 Fullerton Cove Road, Fullerton Cove, NSW

Client: Monteath and Powys

AEP Ref: 3063

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 efforts.

The vegetation within the site was found to be commensurate with PCT's 1646, 1717 & 1737 with the remainder of the Subject Site comprising of existing infrastructure and tracks. PCT 1728 will be impacted for the business signage.

The proposal will require impact to 2.27ha of native vegetation and as a result, a total of 20 Biodiversity Offsets Credits will be required to be retired to offset the residual impacts to native vegetation and achieve a no net loss standard.

4.0 References

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Appendix A – Development Plan

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE ROAD, FULLERTON COVE, 2318
CIVIL ENGINEERING PACKAGE

IMAGE SOURCE : NEARMAPS

LOCALITY PLAN

DRAWING LIST

DWG No.	DRAWING TITLE
DA-C01.01	COVER SHEET, DRAWING LIST AND LOCALITY PLAN
DA-C01.21	GENERAL ARRANGEMENT PLAN
DA-C02.01	EROSION AND SEDIMENT CONTROL PLAN
DA-C02.11	EROSION AND SEDIMENT CONTROL DETAILS
DA-C03.01	CUT AND FILL PLAN
DA-C03.21	CUT AND FILL SECTIONS
DA-C04.01	CIVIL WORKS PLAN - SHEET 1
DA-C04.02	CIVIL WORKS PLAN - SHEET 2
DA-C05.01	SWEPT PATHS PLAN - B99 MANOEUVRES
DA-C05.02	SWEPT PATHS PLAN - SRV MANOEUVRES
DA-C05.03	SWEPTS PATH PLAN - MRV MANOEUVRES
DA-C05.04	SWEPT PATHS PLAN - AV MANOEUVRES - SHEET 1
DA-C05.05	SWEPT PATHS PLAN - AV MANOEUVRES - SHEET 2
DA-C05.06	SWEPT PATHS PLAN - AV MANOEUVRES - SHEET 3
DA-C05.07	SWEPT PATHS PLAN - AV MANOEUVRES - SHEET 4
DA-C05.08	SWEPT PATHS PLAN - AV MANOEUVRES - SHEET 5
DA-C09.01	CIVIL DETAILS

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COVER SHEET, DRAWING LIST AND LOCALITY PLAN

JOB NUMBER
NL161067

DRAWING NUMBER
DA-C01.01

REVISION
B

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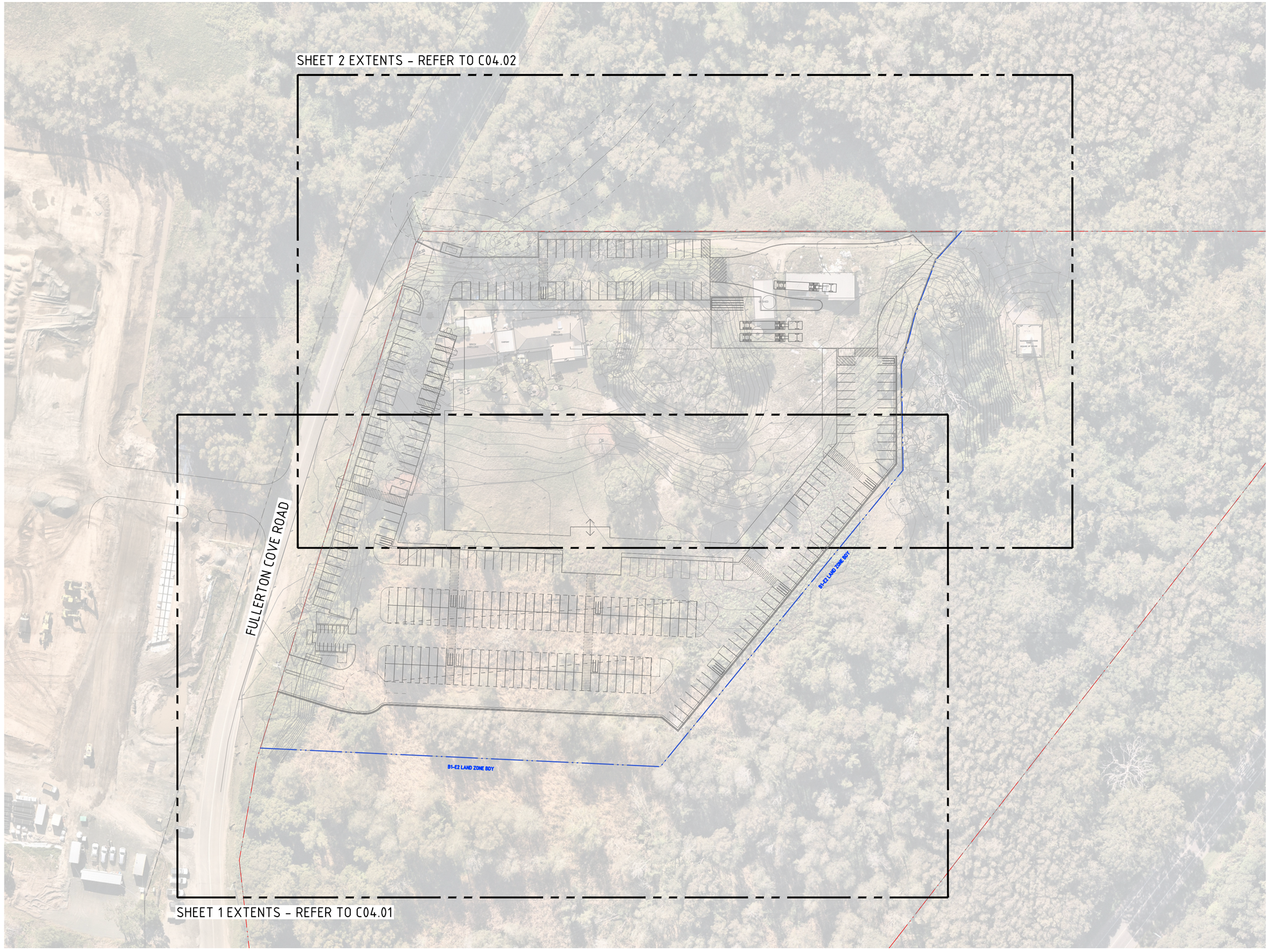

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0 5 10 15 20 25m

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GENERAL ARRANGEMENT PLAN

JOB NUMBER **NL161067**

DRAWING NUMBER **DA-C01.21**

REVISION **C**

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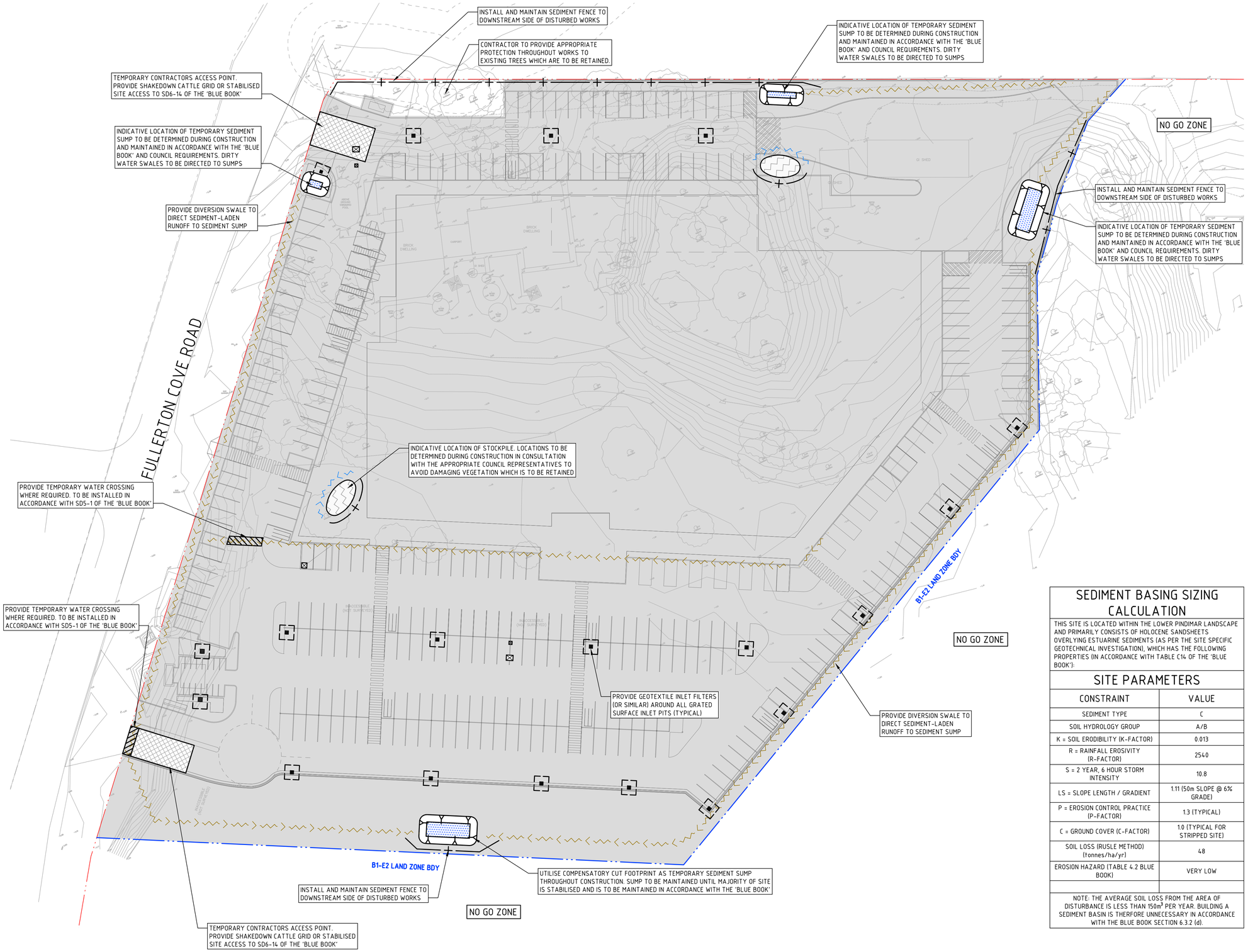

LEGEND

- SITE BOUNDARY LINE
- B1-E2 ZONE BOUNDARY
- SEDIMENT FENCE
- SECURITY FENCE
- GEOTEXTILE INLET FILTER
- DIVERSION DRAIN (CLEAN)
- DIVERSION DRAIN (DIRTY)
- STABILISED SITE ACCESS
- STOCKPILES
- EXISTING CONTOURS (X.Xm INTERVAL)
- INDICATIVE EXTENT OF DISTURBANCE
- SEDIMENT BASIN
- TEMPORARY WATER CROSSING

NOTES

1. ALL EROSION AND SEDIMENTATION CONTROL MEASURES MUST BE APPROPRIATE FOR THE SEDIMENT TYPE(S) OF THE SOILS ON-SITE, IN ACCORDANCE WITH THE 'BLUE BOOK' (MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION. LANDCOM, 2004), OR OTHER CURRENT RECOGNISED INDUSTRY STANDARDS FOR EROSION AND SEDIMENT CONTROL FOR AUSTRALIAN CONDITIONS. THIS INCLUDES SEDIMENT TRAPS AND LINING OF CHANNELS.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING A DETAILED WRITTEN RECORD OF ALL EROSION AND SEDIMENT CONTROLS ON-SITE DURING THE CONSTRUCTION PERIOD. THIS RECORD SHALL BE UPDATED ON A DAILY BASIS AND SHALL CONTAIN DETAILS ON THE CONDITION OF CONTROLS AND ANY/ALL MAINTENANCE, CLEANING AND BREACHES. THIS RECORD SHALL BE KEPT ON-SITE AT ALL TIMES AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE PRINCIPAL CERTIFYING AUTHORITY AND THE SUPERINTENDENT DURING NORMAL WORKING HOURS.
3. INSTALL SEDIMENT PROTECTION FILTERS ON ALL NEW AND EXISTING STORMWATER INLET PITS IN ACCORDANCE WITH EITHER THE MESH AND GRAVEL INLET FILTER DETAIL SD6-11 OR THE GEOTEXTILE INLET FILTER DETAIL SD6-12 OF THE 'BLUE BOOK'.
4. ESTABLISH ALL REQUIRED SEDIMENT FENCES IN ACCORDANCE WITH DETAIL SD6-8 OF THE 'BLUE BOOK'.
5. INSTALL SEDIMENT FENCING, OR OTHER SEDIMENT CONTROL DEVICES, AROUND INDIVIDUAL BUILDING ZONES/AREAS AS REQUIRED AND AS DIRECTED BY THE SUPERINTENDENT OR APPROPRIATE COUNCIL OFFICER.
6. ALL TRENCHES INCLUDING ALL SERVICE TRENCHES AND SWALE EXCAVATION SHALL BE SIDE-CAST TO THE HIGH SIDE AND CLOSED AT THE END OF EACH DAYS WORK.
7. THE CONTRACTOR SHALL ENSURE THAT ALL VEGETATION (TREE, SHRUB AND GROUND COVER) WHICH IS TO BE RETAINED SHALL BE PROTECTED DURING THE DURATION OF CONSTRUCTION.
8. ALL VEGETATION TO BE REMOVED SHALL BE MULCHED ON-SITE AND SPREAD/STOCKPILED AS DIRECTED BY THE SUPERINTENDENT.
9. STRIP TOPSOIL IN AREAS DESIGNATED FOR STRIPPING AND STOCKPILE FOR RE-USE AS REQUIRED. ANY SURPLUS MATERIAL SHALL BE SPREAD ON-SITE AS DIRECTED BY THE SUPERINTENDENT OR REMOVED FROM SITE AND DISPOSED OF IN ACCORDANCE WITH EPA GUIDELINES.
10. CONSTRUCT AND MAINTAIN ALL MATERIAL STOCKPILES IN ACCORDANCE WITH DETAIL SD4-1 OF THE 'BLUE BOOK' (INCLUDING CUT-OFF SWALES TO THE HIGH SIDE AND SEDIMENT FENCES TO THE LOW SIDE).
11. ENSURE STOCKPILES DO NOT EXCEED 2.0m HIGH. PROVIDE WIND AND RAIN EROSION PROTECTION AS REQUIRED IN ACCORDANCE WITH THE 'BLUE BOOK'.
12. PROVIDE WATER TRUCKS OR SPRINKLER DEVICES DURING CONSTRUCTION AS REQUIRED TO SUPPRESS DUST.
13. ONCE CUT/FILL OPERATIONS HAVE BEEN FINALIZED ALL DISTURBED AREAS THAT ARE NOT BEING WORKED ON SHALL BE RE-VEGETATED AS SOON AS IS PRACTICAL.

SEDIMENT BASING SIZING CALCULATION

THIS SITE IS LOCATED WITHIN THE LOWER PINDIMAR LANDSCAPE AND PRIMARILY CONSISTS OF HOLOCENE SANDSHEETS OVERLYING ESTUARINE SEDIMENTS (AS PER THE SITE SPECIFIC GEOTECHNICAL INVESTIGATION), WHICH HAS THE FOLLOWING PROPERTIES (IN ACCORDANCE WITH TABLE C14 OF THE 'BLUE BOOK'):

SITE PARAMETERS

CONSTRAINT	VALUE
SEDIMENT TYPE	C
SOIL HYDROLOGY GROUP	A/B
K = SOIL ERODIBILITY (K-FACTOR)	0.013
R = RAINFALL EROSIVITY (R-FACTOR)	2540
S = 2 YEAR, 6 HOUR STORM INTENSITY	10.8
LS = SLOPE LENGTH / GRADIENT	1.11 (50m SLOPE @ 6% GRADE)
P = EROSION CONTROL PRACTICE (P-FACTOR)	1.3 (TYPICAL)
C = GROUND COVER (C-FACTOR)	1.0 (TYPICAL FOR STRIPPED SITE)
SOIL LOSS (RUSLE METHOD) (tonnes/ha/yr)	48
EROSION HAZARD (TABLE 4.2 BLUE BOOK)	VERY LOW

NOTE: THE AVERAGE SOIL LOSS FROM THE AREA OF DISTURBANCE IS LESS THAN 150m³ PER YEAR. BUILDING A SEDIMENT BASIN IS THERFORE UNNECESSARY IN ACCORDANCE WITH THE BLUE BOOK SECTION 6.3.2 (d).

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DRAWING TITLE: **CIVIL ENGINEERING PACKAGE**

EROSION AND SEDIMENT CONTROL PLAN

JOB NUMBER: **NL161067**

DRAWING NUMBER: **DA-C02.01**

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LEGEND

SITE BOUNDARY LINE	
B1-E2 ZONE BOUNDARY	
STORMWATER PIPE	
SW PIT CL xx.xx	STORMWATER PIT AND TAG COVER LEVEL
RWT	BELOW GROUND RAINWATER TANK
RWT	ABOVE GROUND RAINWATER TANK
GTD	GRATED TRENCH DRAIN
	LANDSCAPE SWALE
	FLAT BASED SWALE/LEVEL SPREADER
DD	DISH DRAIN
	HEADWALL
FFL XX.XX	PROPOSED FINISHED FLOOR LEVEL
XX.XX	DESIGN CONTOURS (0.1m INTERVALS)
XX.XX	EXISTING CONTOURS (0.2m INTERVALS)
	PROPOSED TRAFFICABLE PAVEMENT
	PROPOSED NON-TRAFFICABLE PAVEMENT
	BUILDING FOOTPRINT
	DRIVEWAY CROSSOVER
	BIO-RETENTION BASIN
RW	RETAINING WALL
FK	FLUSH KERB
KO	KERB ONLY
KG	KERB AND GUTTER
MKG	MODIFIED KERB AND GUTTER
• RL XX.XX	PROPOSED SPOT HEIGHT
+ eRL XX.XX	EXISTING SPOT HEIGHT
FALL	DIRECTION OF GRADE
KR	KERB RAMP
	VEHICLE BARRIER
	SCOUR PROTECTION
	ROUNDABOUT ANNULUS
	OCEAN PROTECT JELLYFISH FILTER

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CIVIL WORKS PLAN - SHEET 1

JOB NUMBER: **NL161067**

DRAWING NUMBER: **DA-C04.01** REVISION: **B**

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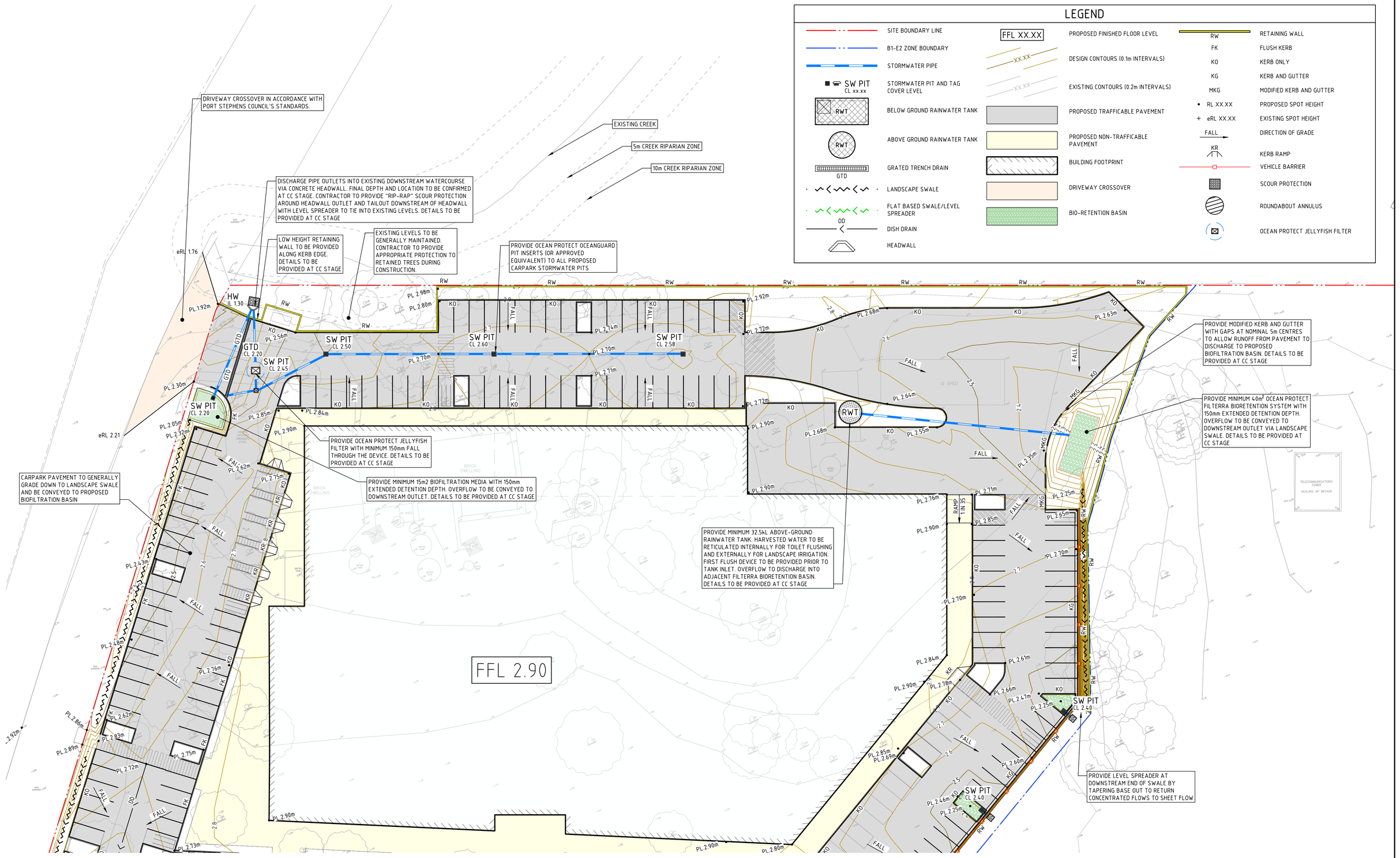

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DRAWING TITLE
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CIVIL WORKS PLAN - SHEET 2

JOB NUMBER **NL161067**

DRAWING NUMBER **DA-C04.02** REVISION **C**

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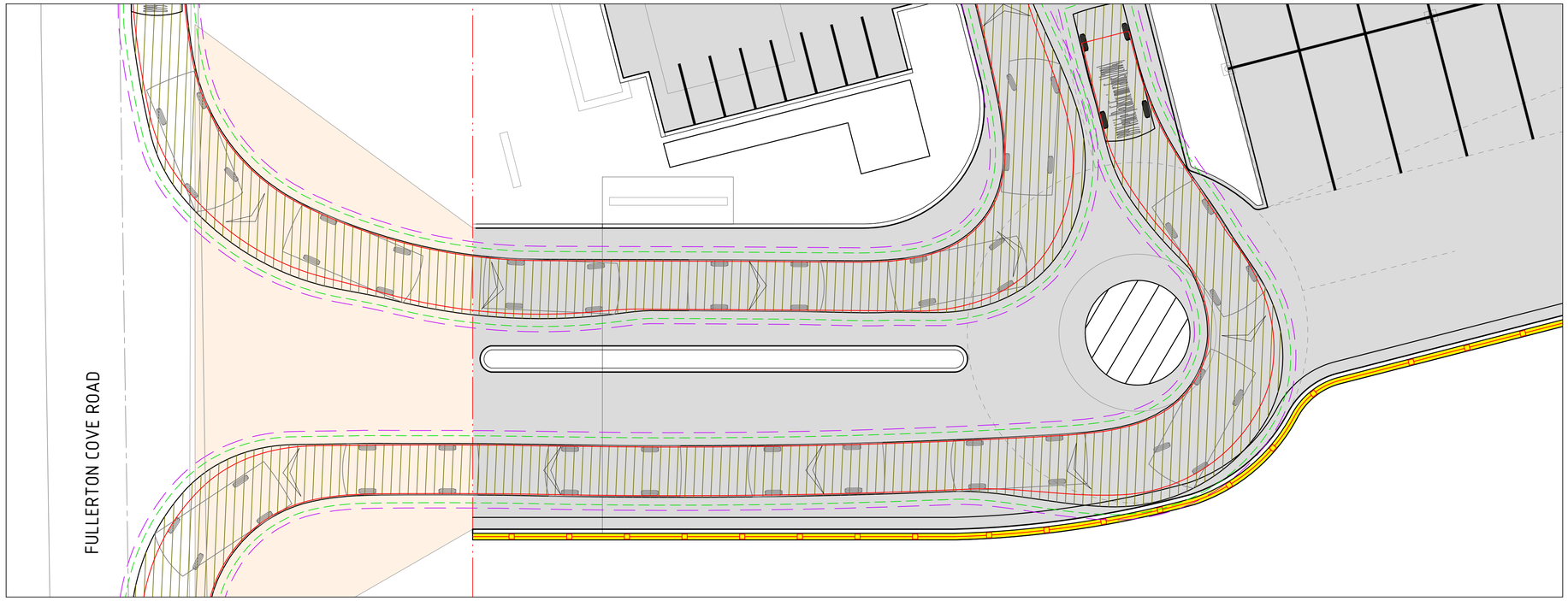
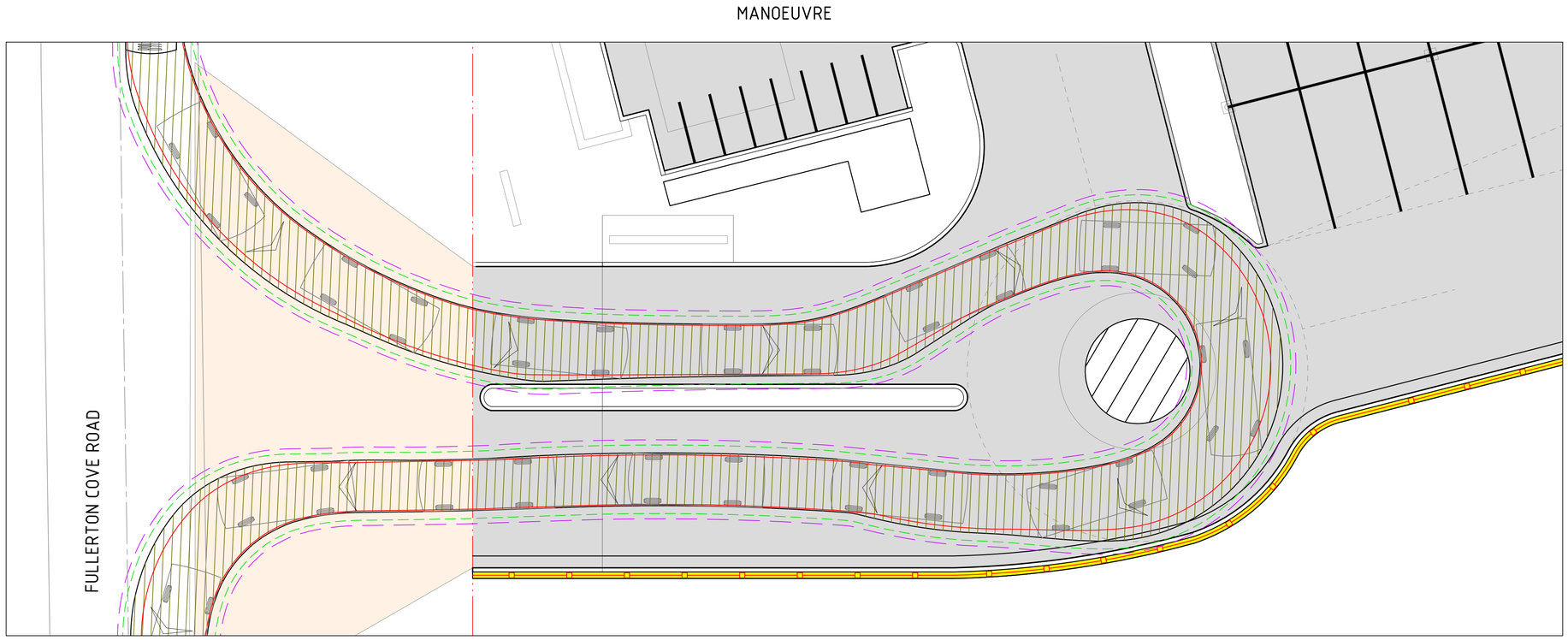


B99 MULTIPLE VEHICLE ROUND-ABOUT MANOEUVRE



B99 SINGLE VEHICLE ROUND-ABOUT MANOEUVRE

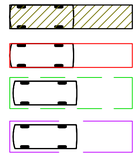
VEHICLE PROFILE

B99 VEHICLE (REALISTIC MIN RADIUS) (2004)

OVERALL LENGTH	5.200m
OVERALL WIDTH	1.940m
OVERALL BODY HEIGHT	1.878m
MIN BODY GROUND CLEARANCE	0.272m
TRACK WIDTH	1.840m
LOCK-TO-LOCK TIME	4.00s
CURB TO CURB TURNING RADIUS	6.250m
TRAVELLING SPEED	5 km/h

VEHICLE MOVEMENTS

FORWARD MOVEMENT



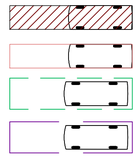
VEHICLE BODY

VEHICLE WHEELS

VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)

VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

REVERSE MOVEMENT



VEHICLE BODY

VEHICLE WHEELS

VEHICLE LATERAL CLEARANCE (0.3m FROM BODY)

VEHICLE LATERAL CLEARANCE (0.5m FROM BODY)

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DRAWN: D. MAVROUDIS DESIGNED: E. GEARING JOB MANAGER: K. SINCLAIR VERIFIER: K. SINCLAIR

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	ISSUED FOR INFORMATION	DM	KS	EG	08.09.23
B	ISSUED FOR DEVELOPMENT APPLICATION	DM	KS	EG	03.10.23

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PROJECT
PROPOSED RETAIL DEVELOPMENT
42 FULLERTON COVER ROAD
FULLERTON COVE
2318

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

SWEPT PATHS PLAN - B99 MANOEUVRES

JOB NUMBER **NL161067**

DRAWING NUMBER **DA-C05.01**

REVISION **B**

DRAWING SHEET SIZE = A1

Date : 05.10.2023 11:41 AM Plotted By : DIMITRI MAVROUDIS Found : \\192.168.5.9\job_files1\YEAR 2016 Jobs\NL161067\O - Drawings\CIVIL\DA\NL161067-DA-C05.01 SWEPT PATHS PLAN.dwg

Appendix B – Flora Species List

Family	Scientific Name	Common Name
Aizoaceae	*Carpobrotus glaucescens*	Pigface
Aizoaceae	*Galenia pubescens**	Galenia
Alliaceae	*Agapanthus spp.**	
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed
Amaranthaceae	*Alternanthera philoxeroides**	Alligator Weed
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort
Apiaceae	*Hydrocotyle sibthorpioides*	Pennywort
Apiaceae	*Platysace lanceolata*	Lance-leaf Platysace
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Araliaceae	*Schefflera actinophylla**	Umbrella Tree
Arecaceae	*Livistona australis*	Cabbage Tree Palm
Arecaceae	*Phoenix canariensis**	Canary Island Date Palm
Asteraceae	*Ambrosia tenuifolia**	Lacy Ragweed
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata**	Bitou Bush
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane
Asteraceae	*Enydra woollsii*	
Asteraceae	*Heterotheca grandiflora**	Telegraph Weed
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Sonchus asper**	Prickly Sow-thistle
Asteraceae	*Ursinia speciosa**	
Basellaceae	*Anredera cordifolia**	Madiera Vine
Bignoniaceae	*Jacaranda mimosifolia**	Jacaranda
Bignoniaceae	*Pandorea pandorana*	Wonga Vine
Blechnaceae	*Telmatoblechnum indicum*	Swamp Water Fern
Bromeliaceae	*Bromelia spp.**	Bromeliads
Cactaceae	*Opuntia stricta**	Prickly Pear
Caryophyllaceae	*Paronychia brasiliana**	Brazilian Whitlow
Caryophyllaceae	*Paronychia franciscana**	Chilean Nailwort
Caryophyllaceae	*Stellaria media**	Common Chickweed
Caryophyllaceae	*Petrorhagia dubia*	
Casuarinaceae	*Casuarina glauca*	Swamp Oak
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew
Convolvulaceae	*Dichondra repens*	Kidney Weed
Convolvulaceae	*Ipomoea cairica**	Coastal Morning Glory
Convolvulaceae	*Ipomoea indica**	Morning Glory
Cyperaceae	*Baumea articulata*	Jointed Twig-Rush
Cyperaceae	*Carex appressa*	Tall Sedge
Cyperaceae	*Carex fascicularis*	Tassel Sedge
Cyperaceae	*Cyperus sesquiflorus**	
Cyperaceae	*Cyperus spp.*	
Dennstaedtiaceae	*Pteridium esculentum*	Bracken

Family	Scientific Name	Common Name
Dilleniaceae	*Hibbertia fasciculata*	
Dilleniaceae	*Hibbertia linearis*	
Ericaceae	*Monotoca elliptica*	Tree Broom-heath
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart
Fabaceae	*Acacia longifolia*	
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea
Fumariaceae	*Fumaria officinalis**	
Iridaceae	*Romulea minutiflora**	Small-flowered Onion Grass
Juglandaceae	*Carya illinoensis**	Pecan
Juncaginaceae	*Triglochin spp.*	
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum
Lauraceae	*Cassytha glabella*	
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Lythraceae	*Lythrum salicaria*	Purple Loosestrife
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine
Moraceae	*Ficus spp.**	
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark
Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea Tree
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive
Onagraceae	*Oenothera mollissima**	
Oxalidaceae	*Oxalis latifolia**	Pink Fishtail
Oxalidaceae	*Oxalis perennans*	Yellow-flowered Wood Sorrel
Oxalidaceae	*Oxalis pes-caprae**	Soursob
Passifloraceae	*Passiflora herbertiana*	Native Passionfruit
Passifloraceae	*Passiflora subpeltata**	White Passionflower
Phormiaceae	*Dianella revoluta*	Blueberry Lily
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree
Pinaceae	*Pinus elliotti**	Slash Pine
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Avena barbata**	Bearded Oats
Poaceae	*Bromus cartharticus**	Prairie Grass
Poaceae	*Cenchrus longispinus**	Innocent Weed
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Eragrostis curvula**	African Lovegrass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Megathyrsus maximus**	Guinea Grass

Family	Scientific Name	Common Name
Poaceae	*Melinus repens**	Red Natal Grass
Poaceae	*Panicum effusum*	Hairy Panic
Poaceae	*Phragmites australis*	Common Reed
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Polygonaceae	*Rumex vulgaris**	Sheep Sorrel
Polygonaceae	*Persicaria strigosa*	
Proteaceae	*Banksia serrata*	Old Man Banksia
Proteaceae	*Grevillea spp.*	
Proteaceae	*Hakea spp.*	
Proteaceae	*Persoonia levis*	Broad-leaved Geebung
Rhamnaceae	*Alphitonia excelsa*	Red Ash
Rosaceae	*Rubus anglocandicans**	Blackberry
Rubiaceae	*Gardenia spp.**	Gardenia
Rubiaceae	*Richardia humistrata**	
Rubiaceae	*Richardia stellaris**	
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo
Selaginaceae	*Hebenstretia dentata**	
Solanaceae	*Solanum nigrum**	Black Nightshade, Black-berry Nightshade
Strelitziaceae	*Strelitzia reginae**	
Thelypteridaceae	*Cyclosorus interruptus*	
Tropaeolaceae	*Tropaeolum majus**	Nasturtium
Typhaceae	*Typha orientalis*	Cumbungi
Verbenaceae	*Lantana camara**	Lantana
Vitaceae	*Cayratia clematidea*	Native Grape

* Denotes an exotic species.

Appendix C – Fauna Species List

EXPECTED FAUNA SPECIES LIST

The following list includes fauna species that could be reasonably expected to occur on or over the study site at some point, given site attributes and location sourced from the NSW BioNet Atlas of Wildlife record of threatened species for the site within a 5km radius.

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

Surveyed Observations/Method of data collection symbols as described below:
Observed (O), Heard (W), Scat (P), Miscellaneous (M), Track/scratchings (F), Nest (E), Burrow (FB), Harp Trap (HT), Elliot Trap (ET), Cage Trap (CT), Camera Trap (Q), Songmeter (AR).
Bat Records **-** Observed (O), Anabat (U)

Threatened species listed under the BC Act or the EPBC Act are as indicated; V: Vulnerable; E: Endangered; CE: Critically Endangered.

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Amphibians						
Limnodynastes peronii	Brown-striped Frog	P		25	W	
Litoria fallax	Eastern Dwarf Tree Frog	P		26	W	
Litoria caerulea	Green Tree Frog	P		5	W	
Litoria peronii	Peron's Tree Frog	P		7	W	
Litoria quiritatus	Screaming Tree Frog	P		0	W	
Litoria tyleri	Tyler's Tree Frog	P		2	W	
Crinia parinsignifera	Eastern Sign-bearing Froglet	P		1		
Pseudophryne bibronii	Bibron's Toadlet	P		4		
Uperoleia fusca	Dusky Toadlet	P		2		
Limnodynastes tasmaniensis	Spotted Grass Frog	P		10		
Crinia signifera	Common Eastern Froglet	P		34		O,W (in Study Area)
Paracrinia haswelli	Haswell's Froglet	P		3		
Pseudophryne coriacea	Red-backed Toadlet	P		2		
Uperoleia laevigata	Smooth Toadlet	P		1		
Litoria dentata	Bleating Tree Frog	P		3		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Litoria latopalmata	Broad-palmed Frog	P		2		
Adelotus brevis	Tusked Frog	P		1		
Platyplectrum ornatum	Ornate Burrowing Frog	P		4		
Birds						
Acanthiza pusilla	Brown Thornbill	P		90		
Gerygone fusca	Western Gerygone	P		1		
Accipiter fasciatus	Brown Goshawk	P		85		
Aquila audax	Wedge-tailed Eagle	P		4		
Circus approximans	Swamp Harrier	P		250		
Elanus axillaris	Black-shouldered Kite	P		140		
Haliastur indus	Brahminy Kite	P		41		
Milvus migrans	Black Kite	P		6		
Acrocephalus australis	Australian Reed-Warbler	P		64		
Anas gracilis	Grey Teal	P		159		
Anas rhynchotis	Australasian Shoveler	P		30		
Aythya australis	Hardhead	P		33		
Chenonetta jubata	Australian Wood Duck	P		107		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Malacorhynchus membranaceus	Pink-eared Duck	P		6		
Anhinga novaehollandiae	Australasian Darter	P		337		
Apus pacificus	Fork-tailed Swift	P	C	4		
Ardea intermedia	Intermediate Egret	P		40		
Bubulcus ibis	Cattle Egret	P		75		
Casmerodius modesta	Eastern Great Egret	P		625		
Egretta novaehollandiae	White-faced Heron	P		1268		
Ixobrychus dubius	Australian Little Bittern	P		2		
Artamus leucoryn	White-breasted Woodswallow	P		79		
Artamus superciliosus	White-browed Woodswallow	P		3		
Cacatua sanguinea	Little Corella	P		59		
Eolophus roseicapilla	Galah	P		120		
Sphecotheres vieilloti	Australasian Figbird	P		146	O,W	
Lalage sueurii	White-winged Triller	P		10		
**Columba livia*	Rock Dove			377		
Macropygia phasianella	Brown Cuckoo-Dove	P		2		
Phaps elegans	Brush Bronzewing	P		2		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Corvus mellori	Little Raven	P		1		
Centropus phasianinus	Pheasant Coucal	P		17		
Chalcites lucidus	Shining Bronze-Cuckoo	P		33		
Heteroscenes pallidus	Pallid Cuckoo	P		4		
Lonchura castaneothorax	Chestnut-breasted Mannikin	P		10		
Falco berigora	Brown Falcon	P		24		
Falco longipennis	Australian Hobby	P		65		
Falcunculus frontatus frontatus	Eastern Shrike-tit	P		2		
**Carduelis carduelis*	European Goldfinch			1		
Petrochelidon ariel	Fairy Martin	P		60		
Chlidonias hybrida	Whiskered Tern	P		4		
Poodytes gramineus	Little Grassbird	P		192		
Malurus lamberti	Variegated Fairy-wren	P		28		OW
Stipiturus malachurus	Southern Emu-wren	P		223		
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	P		3		
Manorina melanocephala	Noisy Miner	P		185		Q
Melithreptus lunatus	White-naped Honeyeater	P		4		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Philemon corniculatus	Noisy Friarbird	P		27		
Phylidonyris novaehollandiae	New Holland Honeyeater	P		7		
Ptilotula penicillata	White-plumed Honeyeater	P		2		
Monarcha melanopsis	Black-faced Monarch	P		4		
Pelagodroma marina	White-faced Storm-Petrel	P		1		
**Passer domesticus*	House Sparrow			37		
Pelecanus conspicillatus	Australian Pelican	P		748		
Petroica rosea	Rose Robin	P		4		
Phalacrocorax carbo	Great Cormorant	P		191		
Phalacrocorax sulcirostris	Little Black Cormorant	P		671		
Coturnix pectoralis	Stubble Quail	P		9		
Synoicus ypsilophora	Brown Quail	P		45		
Podargus strigoides	Tawny Frogmouth	P		24		
Tachybaptus novaehollandiae	Australasian Grebe	P		54		
Psephotus haematonotus	Red-rumped Parrot	P		11		
Ptilonorhynchus violaceus	Satin Bowerbird	P		3		
Gallinula tenebrosa	Dusky Moorhen	P		17		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Ninox novaeseelandiae	Southern Boobook	P		2		
**Acridotheres tristis*	Common Myna			253		
Platalea flavipes	Yellow-billed Spoonbill	P		6		
Plegadis falcinellus	Glossy Ibis	P		5		
Threskiornis spinicollis	Straw-necked Ibis	P		100		
Tyto javanica	Eastern Barn Owl	P		10		
Gymnorhina tibicen	Australian Magpie	P		501	O,W	
Corvus coronoides	Australian Raven	P		485	O,W	
Coracina novaehollandiae	Black-faced Cuckoo-shrike	P		270	O,W	
Entomyzon cyanotis	Blue-faced Honeyeater	P		28	O,W	
Gerygone mouki	Brown Gerygone	P		9	O,W	
Scythrops novaehollandiae	Channel-billed Cuckoo	P		56	O,W	O
Eurystomus orientalis	Dollarbird	P		24	O,W	
Eudynamys orientalis	Eastern Koel	P		79	O,W	
Platycercus eximius	Eastern Rosella	P		220	O,W	
Acanthorhynchus tenuirostris	Eastern Spinebill	P		63	O,W	
Psophodes olivaceus	Eastern Whipbird	P		54	O,W	O,W

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Eopsaltria australis	Eastern Yellow Robin	P		87	O,W	
Cacomantis flabelliformis	Fan-tailed Cuckoo	P		65	O,W	
Pachycephala pectoralis	Golden Whistler	P		107	O,W	
Cracticus torquatus	Grey Butcherbird	P		299	O,W	Q
Rhipidura albiscapa	Grey Fantail	P		302	O,W	Q
Dacelo novaeguineae	Laughing Kookaburra	P		185	O,W	O,W
Meliphaga lewinii	Lewin's Honeyeater	P		42	O,W	
Grallina cyanoleuca	Magpie-lark	P		461	O,W	O,W
Glossopsitta concinna	Musk Lorikeet	P		7	O,W	
Oriolus sagittatus	Olive-backed Oriole	P		74	O,W	
Cracticus nigrogularis	Pied Butcherbird	P		128	O,W	
Ninox strenua	Powerful Owl	V		4	O,W	
Porphyrio porphyrio	Purple Swamphen	P		140	O,W	Q
Trichoglossus haematodus	Rainbow Lorikeet	P		235	O,W	
Anthochaera carunculata	Red Wattlebird	P		164	O,W	
Neochmia temporalis	Red-browed Finch	P		80	O,W	Q
Rhipidura rufifrons	Rufous Fantail	P		20	O,W, Q	O,W, Q

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Todiramphus sanctus	Sacred Kingfisher	P		195	O,W	
Myzomela sanguinolenta	Scarlet Honeyeater	P		19	O,W	
Zosterops lateralis	Silvereye	P		352	O,W	
Pardalotus punctatus	Spotted Pardalote	P		14	O,W	
Acanthiza lineata	Striated Thornbill	P		3	O,W	
Malurus cyaneus	Superb Fairy-wren	P		640	O,W	O,W
Sericornis frontalis	White-browed Scrubwren	P		139	O,W	
Gerygone olivacea	White-throated Gerygone	P		6	O,W	
Acanthiza nana	Yellow Thornbill	P		212	O,W	
Caligavis chrysops	Yellow-faced Honeyeater	P		135	O,W	
Zanda funereus	Yellow-tailed Black-Cockatoo	P		99	O,W	W
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P		19		
Acanthiza reguloides	Buff-rumped Thornbill	P		2		
Gerygone levigaster	Mangrove Gerygone	P		104		
Smicrornis brevirostris	Weebill	P		1		
Accipiter cirrocephalus	Collared Sparrowhawk	P		10		
Accipiter novaehollandiae	Grey Goshawk	P		16		Q

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Aviceda subcristata	Pacific Baza	P		1		
Haliastur sphenurus	Whistling Kite	P		223		
Aegotheles cristatus	Australian Owlet-nightjar	P		4		Q
Ceyx azureus	Azure Kingfisher	P		97		
Todiramphus macleayii	Forest Kingfisher	P		3		
Anas castanea	Chestnut Teal	P		487		
**Anas platyrhynchos*	Mallard			1		
Anas superciliosa	Pacific Black Duck	P		367		O
Biziura lobata	Musk Duck	P		6		
Cygnus atratus	Black Swan	P		212		
Ardea pacifica	White-necked Heron	P		80		
Butorides striata	Striated Heron	P		173		
Egretta garzetta	Little Egret	P		338		
Egretta sacra	Eastern Reef Egret	P		2		
Nycticorax caledonicus	Nankeen Night Heron	P		10		
Artamus personatus	Masked Woodswallow	P		1		
Strepera graculina	Pied Currawong	P		133		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Cacatua galerita	Sulphur-crested Cockatoo	P		55		
Cacatua tenuirostris	Long-billed Corella	P		2		
Nymphicus hollandicus	Cockatiel	P		1		
Coracina papuensis	White-bellied Cuckoo-shrike	P		2		
Vanellus miles	Masked Lapwing	P		1152		
Cisticola exilis	Golden-headed Cisticola	P		267		
Cormobates leucophaea	White-throated Treecreeper	P		86		
Columba leucomela	White-headed Pigeon	P		3		
Geopelia humeralis	Bar-shouldered Dove	P		91		
Lopholaimus antarcticus	Topknot Pigeon	P		14		
Ocyphaps lophotes	Crested Pigeon	P		190		
**Spilopelia chinensis*	Spotted Turtle-Dove			230		
Corvus orru	Torresian Crow	P		31		
Cacomantis variolosus	Brush Cuckoo	P		5		
Chalcites basalis	Horsfield's Bronze-Cuckoo	P		14		
Dicaeum hirundinaceum	Mistletoebird	P		109		
Dicrurus bracteatus	Spangled Drongo	P		39		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Stizoptera bichenovii	Double-barred Finch	P		61		
Falco cenchroides cenchroides	Nankeen Kestrel	P		106		
Falco peregrinus	Peregrine Falcon	P		33		
Hirundo neoxena	Welcome Swallow	P		388		
Petrochelidon nigricans	Tree Martin	P		15		
Cincloramphus cruralis	Brown Songlark	P		18		
Cincloramphus timoriensis	Tawny Grassbird	P		156		
Anthochaera chrysoptera	Little Wattlebird	P		238		
Lichmera indistincta	Brown Honeyeater	P		350		Q
Manorina melanophrys	Bell Miner	P		3		
Melithreptus brevirostris	Brown-headed Honeyeater	P		3		
Phylidonyris niger	White-cheeked Honeyeater	P		54		
Plectorhyncha lanceolata	Striped Honeyeater	P		169		
Merops ornatus	Rainbow Bee-eater	P		2		
Myiagra rubecula	Leaden Flycatcher	P		21		
Anthus novaeseelandiae	Australian Pipit	P		242		
Colluricincla harmonica	Grey Shrike-thrush	P		155		Q

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Pachycephala rufiventris	Rufous Whistler	P		59		
Pardalotus striatus	Striated Pardalote	P		4		
Microeca fascinans	Jacky Winter	P		1		
Microcarbo melanoleucos	Little Pied Cormorant	P		482		
Phalacrocorax varius	Pied Cormorant	P		564		
Alisterus scapularis	Australian King-Parrot	P		1		
Platycercus elegans	Crimson Rosella	P		3		
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	P		27		
Fulica atra	Eurasian Coot	P		26		
Hypotaenidia philippensis	Buff-banded Rail	P		21		
Porzana fluminea	Australian Spotted Crake	P		20		
Porzana tabuensis	Spotless Crake	P		2		
Rhipidura leucophrys	Willie Wagtail	P		449		
**Sturnus vulgaris*	Common Starling			163		
Platalea regia	Royal Spoonbill	P		427		
Threskiornis moluccus	Australian White Ibis	P		826		
Turnix varius	Painted Button-quail	P		1		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Mammals						
**Rattus rattus*	Black Rat			27	Q	Q
Antechinus stuartii	Brown Antechinus	P		44	H	Q
Trichosurus vulpecula	Common Brushtail Possum	P		16	CT, O	Q
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V		15	U	
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		3	U	
Vespadelus pumilus	Eastern Forest Bat	P		12	U	
Ozimops ridei	Eastern Free-tailed Bat	P		12	U	
Acrobates pygmaeus	Feathertail Glider	P		3	Q	
Nyctophilus gouldi	Gould's Long-eared Bat	P		7	H	
Chalinolobus gouldii	Gould's Wattled Bat	P		27	U	
Scoteanax rueppellii	Greater Broad-nosed Bat	V		8	U	
**Mus musculus*	House Mouse			13	ET	Q
Nyctophilus geoffroyi	Lesser Long-eared Bat	P		12	H	
Miniopterus australis	Little Bent-winged Bat	V		15	U	
Vespadelus vulturnus	Little Forest Bat	P		64	U	
Myotis macropus	Southern Myotis	V		8	U	

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Rattus lutreolus	Swamp Rat	P		14	ET	
Austronomus australis	White-striped Freetail-bat	P		13	U	
Isoodon macrourus	Northern Brown Bandicoot	P		3		
Perameles nasuta	Long-nosed Bandicoot	P		1		
Petaurus breviceps	Sugar Glider	P		1		
Pseudocheirus peregrinus	Common Ringtail Possum	P		10		
Macropus giganteus	Eastern Grey Kangaroo	P		10		
Notamacropus rufogriseus	Red-necked Wallaby	P		8		
Pteropus alecto	Black Flying-fox	P		6		
Pteropus scapulatus	Little Red Flying-fox	P		2		
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		5	U	
Chalinolobus morio	Chocolate Wattled Bat	P		16		
Vespadelus darlingtoni	Large Forest Bat	P		3		
Vespadelus regulus	Southern Forest Bat	P		2		
Miniopterus orianae oceanensis	Large Bent-winged Bat	V		8		
**Vulpes vulpes*	Fox			16		Q
Tachyglossus aculeatus	Short-beaked Echidna	P		9		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Wallabia bicolor	Swamp Wallaby	P		5		
Ozimops planiceps	South-eastern Free-tailed Bat			1		
Scotorepens orion	Eastern Broad-nosed Bat	P		12		
Rattus fuscipes	Bush Rat	P		5		Q
**Canis lupus*	Dingo, domestic dog			3		
**Oryctolagus cuniculus*	Rabbit			7		
Reptiles						
Vermicella annulata	Bandy-bandy	P		1		
Concinnia tenuis	Barred-sided Skink	P		5		
Pogona barbata	Bearded Dragon	P		3		
Hemiaspis signata	Black-bellied Swamp Snake	P		4		
Morelia spilota	Carpet & Diamond Pythons	P		1		
Dendrelaphis punctulatus	Common Tree Snake	P		6		
Ctenotus taeniolatus	Copper-tailed Skink	P		1		
Lampropholis delicata	Dark-flecked Garden Sunskink	P		14		
Tiliqua scincoides	Eastern Blue-tongue	P		23		
Pseudonaja textilis	Eastern Brown Snake	P		7		

Scientific Name	Common Name	NSW status	Comm. status	BioNet Atlas Records	Recorded during Kleinfelder Surveys	Recorded during AEP Surveys
Cryptophis nigrescens	Eastern Small-eyed Snake	P		2		
Chelodina longicollis	Eastern Snake-necked Turtle	P		4		
Eulamprus quoyii	Eastern Water-skink	P		1		
Amphibolurus muricatus	Jacky Lizard	P		5		
Varanus varius	Lace Monitor	P		8	O	
Bellatorias major	Land Mullet	P		4	CT	
Lampropholis guichenoti	Pale-flecked Garden Sunskink	P		3		O
Anomalopus swansoni	Punctate Worm-skink	P		2		
Pseudechis porphyriacus	Red-bellied Black Snake	P		15		
Ctenotus robustus	Robust Ctenotus	P		8		
Carlia tetradactyla	Southern Rainbow-skink	P		1		
Saiphos equalis	Three-toed Skink	P		2		
Saproscincus mustelinus	Weasel Skink	P		1		
Demansia psammophis	Yellow-faced Whip Snake	P		1		

Appendix D – BAM Plot Data

Family	Scientific Name	Common Name	BAM Growth Form	HTE V3	Present on Site	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Myrtaceae	*Melaleuca styphelioides*	Prickly-leaved Tea Tree	Shrub		1							10
Aizoaceae	*Carpobrotus glaucescens*	Pigface	Forb		1				0.1	2		
Aizoaceae	*Galenia pubescens**	Galenia	nil - exotic	Y	1				2			
Alliaceae	*Agapanthus spp.**		nil - exotic		1						0.1	
Amaranthaceae	*Alternanthera denticulata*	Lesser Joyweed	Forb		1		0.2					
Amaranthaceae	*Alternanthera philoxeroides**	Alligator Weed	nil - exotic	Y	1							1
Apiaceae	*Hydrocotyle bonariensis**	Kurnell Curse / Pennywort	nil - exotic		1		0.5		25	0.5	0.1	0.2
Apiaceae	*Hydrocotyle sibthorpioides*	Pennywort	Forb		1						0.1	
Apiaceae	*Platysace lanceolata*	Lance-leaf Platysace	Shrub		1	0.1						
Apocynaceae	*Parsonsia straminea*	Common Silkpod	Vine		1		1	0.2				3
Araliaceae	*Schefflera actinophylla**	Umbrella Tree	nil - exotic	Y	1						0.5	
Arecaceae	*Livistona australis*	Cabbage Tree Palm	Palm & palmlike		1						1	1
Arecaceae	*Phoenix canariensis**	Canary Island Date Palm	nil - exotic	Y	1						3	
Asteraceae	*Ambrosia tenuifolia**	Lacy Ragweed	nil - exotic		1	0.1			0.5	0.1		
Asteraceae	*Bidens pilosa**	Cobbler's Pegs	nil - exotic	Y	1	0.2						
Asteraceae	*Chrysanthemoides monilifera subsp. rotundata**	Bitou Bush	nil - exotic	Y	1	60				2		
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane	nil - exotic		1						0.1	
Asteraceae	*Enydra woollsii*		Forb		1							15
Asteraceae	*Heterotheca grandiflora**	Telegraph Weed	nil - exotic		1				1			
Asteraceae	*Hypochaeris radicata**	Flatweed	nil - exotic		1				0.1	0.5	5	
Asteraceae	*Sonchus asper**	Prickly Sow-thistle	nil - exotic		1						0.1	
Asteraceae	*Ursinia speciosa**		nil - exotic		1				2	3		
Basellaceae	*Anredera cordifolia**	Madiera Vine	nil - exotic	Y	1	0.1						
Bignoniaceae	*Jacaranda mimosifolia**	Jacaranda	nil - exotic		1						1	
Bignoniaceae	*Pandorea pandorana*	Wonga Vine	Vine		1	0.2						
Blechnaceae	*Telmatoblechnum indicum*	Swamp Water Fern	Fern and fern allies		1						0.1	
Bromeliaceae	*Bromelia spp.**	Bromeliads	nil - exotic		1						0.1	
Cactaceae	*Opuntia stricta**	Prickly Pear	nil - exotic	Y	1				0.1			
Caryophyllaceae	*Paronychia brasiliana**	Brazilian Whitlow	nil - exotic		1						5	
Caryophyllaceae	*Paronychia franciscana**	Chilean Nailwort	nil - exotic		1				0.1	0.1		
Caryophyllaceae	*Stellaria media**	Common Chickweed	nil - exotic		1				0.1			
Caryophyllaceae	*Petrorhagia dubia*		nil - exotic		1				0.1	0.1		
Casuarinaceae	*Casuarina glauca*	Swamp Oak	Tree		1		10	1				20
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew	Forb		1	0.1						
Convolvulaceae	*Dichondra repens*	Kidney Weed	Forb		1						2	
Convolvulaceae	*Ipomoea cairica**	Coastal Morning Glory	nil - exotic	Y	1							2
Convolvulaceae	*Ipomoea indica**	Morning Glory	nil - exotic	Y	1		5	0.2		0.5		
Cyperaceae	*Baumea articulata*	Jointed Twig-Rush	Sedge		1		1	0.1				0.5
Cyperaceae	*Carex appressa*	Tall Sedge	Sedge		1							20
Cyperaceae	*Carex fascicularis*	Tassel Sedge	Sedge		1							5
Cyperaceae	*Cyperus sesquiflorus**		nil - exotic		1						2	
Cyperaceae	*Cyperus spp.*		Sedge		1				0.1			
Dennstaedtiaceae	*Pteridium esculentum*	Bracken	Fern and fern allies		1	5			15	25		
Dilleniaceae	*Hibbertia fasciculata*		Shrub		1				0.1			
Dilleniaceae	*Hibbertia linearis*		Shrub		1	0.1						
Ericaceae	*Monotoca elliptica*	Tree Broom-heath	Heath shrub		1	5				2		
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	Shrub		1	5						
Euphorbiaceae	*Homalanthus populifolius*	Bleeding Heart	Shrub		1	0.1						
Fabaceae	*Acacia longifolia*		Shrub		1	0.3				1		
Fabaceae	*Kennedia rubicunda*	Dusky Coral Pea	Vine		1	0.2						
Fumariaceae	*Fumaria officinalis**		nil - exotic		1	0.1						
Iridaceae	*Romulea minutiflora**	Small-flowered Onion Grass	nil - exotic		1						1	
Juglandaceae	*Carya illinoensis**	Pecan	nil - exotic		1					0.1		
Juncaginaceae	*Triglochin spp.*		Forb		1		20					
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum	Tree		1	0.3						
Lauraceae	*Cassytha glabella*		Vine		1	5			0.2			
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	Rush		1	0.5						

Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	Vine		1	1							
Lythraceae	*Lythrum salicaria*	Purple Loosestrife	Forb		1								0.1
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	nil - exotic		1	0.1			2				
Menispermaceae	*Sarcopetalum harveyanum*	Pearl Vine	Vine		1	1							
Moraceae	*Ficus spp.**		nil - exotic		1							5	
Moraceae	*Maclura cochinchinensis*	Cockspur Thorn	Vine		1	0.1							
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	Tree		1	40							
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint	Tree		1	30							
Myrtaceae	*Melaleuca quinquenervia*	Broad-leaved Paperbark	Tree		1		35	5				30	
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive	Tree		1	0.1							
Onagraceae	*Oenothera mollissima**		nil - exotic		1				0.5	0.1			
Oxalidaceae	*Oxalis latifolia**	Pink Fishtail	nil - exotic		1							0.1	
Oxalidaceae	*Oxalis perennans*	Yellow-flowered Wood Sorrel	Forb		1							0.1	
Oxalidaceae	*Oxalis pes-caprae**	Soursob	nil - exotic		1	0.1			0.1				
Passifloraceae	*Passiflora herbertiana*	Native Passionfruit	Vine		1	0.2							
Passifloraceae	*Passiflora subpeltata**	White Passionflower	nil - exotic		1	0.2							
Phormiaceae	*Dianella revoluta*	Blueberry Lily	Forb		1	0.5							
Phyllanthaceae	*Glochidion ferdinandi*	Cheese Tree	Tree		1	1						2	5
Pinaceae	*Pinus elliotti**	Slash Pine	nil - exotic	Y	1					5			
Pittosporaceae	*Billardiera scandens*	Hairy Appleberry	Vine		1	0.1							
Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	Shrub		1	1							
Plantaginaceae	*Plantago lanceolata**	Ribwort	nil - exotic		1				0.2			1	
Poaceae	*Avena barbata**	Bearded Oats	nil - exotic		1				10				
Poaceae	*Bromus cartharticus**	Prairie Grass	nil - exotic		1							10	
Poaceae	*Cenchrus longispinus**	Innocent Weed	nil - exotic	Y	1				0.1				
Poaceae	*Cynodon dactylon*	Common Couch	Other Grass		1				5	2		1	
Poaceae	*Eragrostis curvula**	African Lovegrass	nil - exotic	Y	1				25	40			
Poaceae	*Imperata cylindrica*	Blady Grass	Tussock Grass		1	0.5							
Poaceae	*Megathyrsus maximus**	Guinea Grass	nil - exotic	Y	1	15						0.2	
Poaceae	*Melinus repens**	Red Natal Grass	nil - exotic		1				0.1	0.1			
Poaceae	*Panicum effusum*	Hairy Panic	Tussock Grass		1				0.1				
Poaceae	*Phragmites australis*	Common Reed	Tussock Grass		1								15
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass	nil - exotic	Y	1			5				20	
Polygonaceae	*Rumex vulgaris**	Sheep Sorrel	nil - exotic	Y	1				2				
Polygonaceae	*Persicaria strigosa*				1		0.1	3					1
Proteaceae	*Banksia serrata*	Old Man Banksia	Tree		1	5							
Proteaceae	*Grevillea spp.*				1					1			
Proteaceae	*Hakea spp.*				1					1			
Proteaceae	*Persoonia levis*	Broad-leaved Geebung	Shrub		1	0.1							
Rhamnaceae	*Alphitonia excelsa*	Red Ash	Tree		1	1							
Rosaceae	*Rubus anglocandicans**	Blackberry	nil - exotic	Y	1	0.1		5					
Rubiaceae	*Gardenia spp.**	Gardenia	nil - exotic		1							1	
Rubiaceae	*Richardia humistrata**		nil - exotic		1							15	
Rubiaceae	*Richardia stellaris**		nil - exotic		1				0.5	0.2			
Sapindaceae	*Cupaniopsis anacardioides*	Tuckeroo	Tree		1	0.1							
Selaginaceae	*Hebenstretia dentata**		nil - exotic		1				2	0.2			
Solanaceae	*Solanum nigrum**	Black Nightshade, Black-berry Nightshad	nil - exotic		1	0.1		0.1	0.5				
Strelitziaceae	*Strelitzia reginae**		nil - exotic		1							0.5	
Thelypteridaceae	*Cyclosorus interruptus*		Fern and fern allies		1		5	2					1
Tropaeolaceae	*Tropaeolum majus**	Nasturtium	nil - exotic		1							0.1	
Typhaceae	*Typha orientalis*	Cumbungi	Rush		1		10	70					
Verbenaceae	*Lantana camara**	Lantana	nil - exotic	Y	1	5				0.5		0.1	
Vitaceae	*Cayratia clematidea*	Native Grape	Vine		1							0.1	

Overall Species Count	110	41	11	11	29	23	32	16
Exotic Species	53	12	2	4	22	16	23	3
Exotic Cover %		81.1	5.5	10.3	74	53	71	3.2
HTE %		80.4	5	10.2	29.2	48	23.8	3

** indicates exotic*

^ indicates non-endemic native eg WA or SA species not naturally occuring

Composition Condition	**Tree (TG)**	**Tree (TG)**	8	2	2	0	0	2	2
	Shrub (SG)	**Shrub (SG)**	8	0	0	1	3	0	1
	Grass & grasslike (GG)	**Grass & grasslike (GG)**	2	2	2	3	1	1	4
	Forb (FG)	**Forb (FG)**	2	2	0	1	1	3	2
	Fern (EG)	**Fern (EG)**	1	1	1	1	1	1	1
	Other (OG)	**Other (OG)**	8	1	1	1	0	2	2
Structure Condition	**Tree (TG)**	**Tree (TG)**	77.5	45	6	0	0	32	25
	Shrub (SG)	**Shrub (SG)**	11.7	0	0	0.1	4	0	10
	Grass & grasslike (GG)	**Grass & grasslike (GG)**	1	11	70.1	5.2	2	1	40.5
	Forb (FG)	**Forb (FG)**	0.6	20.2	0	0.1	2	2.2	15.1
	Fern (EG)	**Fern (EG)**	5	5	2	15	25	0.1	1
	Other (OG)	**Other (OG)**	7.8	1	0.2	0.2	0	1.1	4
	High Threat Exotics	**High Threat Exotics**	80.4	5	10.2	29.2	48	23.8	3

Appendix E – Biodiversity Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00036337/BAAS19076/22/00036338

Proposal Name
3063 Fullerton Cove 43

BAM data last updated *
22/06/2023

Assessor Name
Natalie S Black

Assessor Number
BAAS19076

BAM Data version *
61

Proponent Names

Report Created
24/10/2023

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: 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
Nil

Additional Information for Approval

PCT Outside Ibra Added

PCT
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

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)

BAM Biodiversity Credit Report (Like for like)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.6	0	10	10
1737-Typha rushland	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.3	0	8	8
1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Not a TEC	1.4	0	1	1
1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.0	0	1	1

1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775, 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	1646_moderate	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.
	Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775, 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	1646_severelydegraded01	No	0	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.

1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Name of offset trading group	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, 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	1717_managed	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.

	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, 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	1717_poor	No	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.

1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808, 3962, 3963, 3985, 3987, 3993, 4016, 4023, 4026, 4027, 4028, 4030, 4035, 4038, 4040, 4048, 4049, 4050, 4056	-	1728_moderate	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.

1737-Typha rushland

Like-for-like credit retirement options

Name of offset trading group	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, 3958, 3962, 3964, 3965, 3967, 3971, 3973, 3975, 3976	-	1737_moderate	No	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.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1646_moderate, 1646_severelydegraded01, 1717_managed, 1737_moderate, 1717_poor**	2.3	24.00

Planigale maculata / Common Planigale	**1646_moderate, 1646_severelydegraded01, 1717_managed, 1737_moderate, 1717_poor, 1728_moderate**	1.3	18.00

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW
Planigale maculata / Common Planigale	Spp	IBRA subregion
	Planigale maculata / Common Planigale	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00036337/BAAS19076/22/00036338

Proposal Name
3063 Fullerton Cove 43

BAM data last updated *
22/06/2023

Assessor Name
Natalie S Black

Assessor Number
BAAS19076

BAM Data version *
61

Proponent Name(s)

Report Created
24/10/2023

BAM Case Status
Open

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
To be finalised

BOS entry trigger
BOS Threshold: 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
Nil

Additional Information for Approval

PCT Outside Ibra Added

PCT
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast

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
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.6	0	10	10.00
1737-Typha rushland	Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.3	0	8	8.00
1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast	Not a TEC	1.4	0	1	1.00
1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	0.0	0	1	1.00

1646-Smooth-barked Apple - Blackbutt - Old Man Banksia woodland on coastal sands of the Central and Lower North Coast

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775, 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	1646_moderate	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.
Coastal Dune Dry Sclerophyll Forests This includes PCT's: 685, 776, 1074, 1135, 1184, 1618, 1637, 1646, 1647, 1648, 1775, 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556	Coastal Dune Dry Sclerophyll Forests <50%	1646_severelydegraded01	No	0	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
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 4 or higher threat status	1646_moderate	No	1	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 4 or higher threat status	1646_severelydegraded01	No	0	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1717-Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast	**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, 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	1717_managed	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.

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, 3272, 3906, 3983, 3985, 3986, 3988, 3989, 3990, 3995, 3997, 3998, 4000, 4001, 4004, 4006, 4009, 4013, 4019, 4020, 4021, 4044, 4047, 4057	-	1717_poor	No	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
Forested Wetlands	Tier 3 or higher threat status	1717_managed	No	2	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	1717_poor	No	8	IBRA Region: NSW North Coast, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
1728-Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions This includes PCT's: 915, 916, 917, 918, 919, 1125, 1230, 1232, 1234, 1235, 1236, 1726, 1727, 1728, 1729, 1731, 1800, 1808, 3962, 3963, 3985, 3987, 3993, 4016, 4023, 4026, 4027, 4028, 4030, 4035, 4038, 4040, 4048, 4049, 4050, 4056	-	1728_moderate	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
	Forested Wetlands	Tier 3 or higher threat status	1728_moderate	No	1	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, 3958, 3962, 3964, 3965, 3967, 3971, 3973, 3975, 3976	-	1737_moderate	No	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
	Freshwater Wetlands	Tier 3 or higher threat status	1737_moderate	No	8	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

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1646_moderate, 1646_severelydegraded01, 1717_managed, 1737_moderate, 1717_poor**	2.3	24.00

Planigale maculata / Common Planigale	**1646_moderate, 1646_severelydegraded01, 1717_managed, 1737_moderate, 1717_poor, 1728_moderate**	1.3	18.00

Credit Retirement Options

Like-for-like options

Myotis macropus/ Southern Myotis	Spp	IBRA region	
	Myotis macropus/Southern Myotis	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	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.
Planigale maculata/ Common Planigale	Spp	IBRA region	
	Planigale maculata/Common Planigale	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing	IBRA region

		under Part 4 of the BC Act shown below	
	Fauna	Vulnerable	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.

Appendix F – Site Photographs

Above: View of part of property infrastructure, view north east

Below: Cleared area of Subject Site, view west from central location

Above: PCT 1646, dominant in exotic vegetation VIS scores around <9.

Below: Forested wetland SE corner of Study Area

Above: Subject Site boundary with C2 retained land, southern corner, view SE

Below: Current Optus infrastructure within the Study Area

Above: Black Rat observed on Camera trap - Klienfelder

Below: Top of bank measurement edge on northern mapped hydroline outside of Subject Site

Above: Northern mapped hydroline outside of Subject Site

Below: Rufous Fantail detected on AEP Camera traps

Above: PCT 1728 with Staghorn

Below: Location of business signage within Study Area.

Above: Proposed business signage area from Fullerton Cove Road corner

Below: Common Eastern Froglets observed during Frog surveys.

Appendix G – Other Legislation

EPBC Act Assessment

A Protected Matters Search of an area of 5km radius of the Study Area was conducted on October 10th 2023 for Matters of National Environmental Significance as relevant to the Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act). The following Matters of National Significance 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 Subject Site is within proximity to the declared Ramsar wetlands of the Hunter estuary wetlands as the proposed development lies approximately 275m south-east of Fullerton Areas mapped under the Hunter Estuary Wetlands would not be directly impacted by the proposed development. Any indirect impacts to these areas would be minimised or avoided by the mitigation measures outlined in **Section 5.3**.;

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:

From a search of the EPBC Act Protected Matters website (24/10/2022), seven (7) listed Threatened Ecological Communities (TECs) were considered likely to occur within a 5km radius of the Study Area.

Three (3) Critically Endangered Ecological Communities:

- Central Hunter Valley eucalypt forest and woodland;
- Lowland Rainforest of Subtropical Australia; and
- River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria.

Three (3) Endangered Ecological Communities:

- Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community;
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions; and
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland.

One (1) Vulnerable Ecological Community:

- Subtropical and Temperate Coastal Saltmarsh.

Ground truthing of vegetation on site identified one PCT is associated with EPBC listed TEC's;

- PCT 1717 – *Swamp Oak – Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* (Poor). This community is

considered to be commensurate with the Endangered Ecological Community Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland;

Assessment of the vegetation community on site against the Scientific Determination for the Endangered Ecological Community Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland was considered commensurate with listed key diagnostic characteristics;

- Occurs within 20km of the coast;
- Contains a minimum canopy cover of 10%;
- The canopy is dominated by *Melaleuca quinquinervia* and contains common diagnostic species, *Parsonsia straminea* (Common Silkpod);
- Other trees may occur in the sub-canopy such as *Casuarina glauca*, which made up 10% of the canopy cover on site.

***Condition class, categories and thresholds**;*

The community on site meets Class B1 of the condition thresholds; containing a patch size of 2-5ha which may or may not be contiguous with other native vegetation AND contains a predominantly native ground layer.

PCT 1717 occurs in two conditions within the site. The managed/poor zone of this PCT is not considered commensurate with the EPBC TEC due to its degraded nature, containing canopy species only.

Significant Impact Criteria for Critically endangered and endangered species

Significant Impact	Assessment
• Reduce the extent of an ecological community;	The proposed development will reduce the extent of this community by 0.46ha, whilst retaining 2.32ha. The retained area will be excluded from development and connectivity throughout the landscape will not be fragmented. The area of reduction is not considered to be significant.
• Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines;	The development will increase edge effects to the retained community, however, will not cause significant fragmentation as the site is already fragmented by roads to the east and west.
• Adversely affect habitat critical to the survival of an ecological community;	The development is unlikely to cause adverse effects to the retained community, harm and minimise impacts are addressed in Stage 2 of this BDAR. Clearing of 0.46ha is not considered to be significant to the survival of this community.
• Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns;	Abiotic impacts are addressed in Stage 2 of this BDAR, and are to be managed pre and post construction to ensure that impacts to the retained vegetation are minimised.
• Cause a substantial change in the species composition of an occurrence of an ecological	Appropriate harm minimisation measures will ensure no substantial change in species

Significant Impact	Assessment
community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting;	composition which may lead to the decline and functionality of this community.
• Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – assisting invasive species, that are harmful to the listed ecological community, to become established, or – causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or	The development may cause some decline in the quality of the retained community, due to indirect impacts such as increased edge effects and potential run off from the development into the retained vegetation; with adequate protections harm to the retained area is expected to be minimal.
• Interfere with the recovery of an ecological community.	The proposal will retain approximately 2.32ha of this community in C2 zoned lands. This will conserve 2.32ha of the community as a result of the development. As such it is unlikely to interfere with the recovery of this community.
Conclusion	The development is likely to cause direct and indirect impacts to the threatened ecological community, including the clearing of 0.46ha of the TEC. Indirect impacts such as fragmentation and increased pollutants may impact the retention area. Harm minimisation measures will be in place to ensure impacts to the retained vegetation will be marginal. This development is unlikely to cause significant impacts to the extent of the community and a referral is not considered necessary.

Threatened Species:

Threatened species listed under the EPBC Act considered likely to occur on site were assessed from field inspections/surveys, Bird Data and using the BioNet Atlas search tool within a 10km search radius to the Study Area with most recent records assessed. The following threatened species were identified within the Study Area and will be subject to species credits or incorporation into ecosystem credits apart from Powerful Owl as this species was identified outside of the Subject Site, to the east of the Study Area. No nest tree, or potential nest tree, was identified during surveys. Based on species' observation and behaviour during spotlighting surveys, the likely location of a potential roost/nest tree (if any) is further to east of the Study Area (**Figure 9**). As a precaution, a 100m buffer has been mapped around the approximate location where the Owl was observed to have originated. The buffer does not overlap with any part of the Subject Site and therefore, no species polygon has been generated for this species.

- *Myotis Macropus (Southern Myotis);*
- *Falsistrellus tasmaniensis* (Eastern False Pipistrelle);
- *Micronomus norfolkensis* (Eastern Coastal Free-tailed Bat);

- *Miniopterus australis* (Little Bent-winged Bat);
- *Myotis macropus* (Southern Myotis);
- *Ninox strenua* (Powerful Owl); and
- *Saccolaimus flaviventris* (Yellow-bellied Sheath tail Bat).

Additionally, *Planigale maculata* (Common planigale) has been assumed present as advised by Port Stephens Council.

Migratory Species:

A number of EPBC listed migratory species have potential to utilise the site on an irregular basis. The limited number and sporadic nature of records close to the Study Area appear to reflect opportunistic rather than regular use of any habitat considered of importance to any threatened species. It is noted that Import Areas mapping for shorebirds is in close proximity to the Subject Site however very minimal habitat is present within the Subject Site.

It is not considered that the development of this land is likely to significantly affect the availability of potential habitat for such mobile species, or disrupt migratory patterns.

EPBC Act Assessment Conclusion:

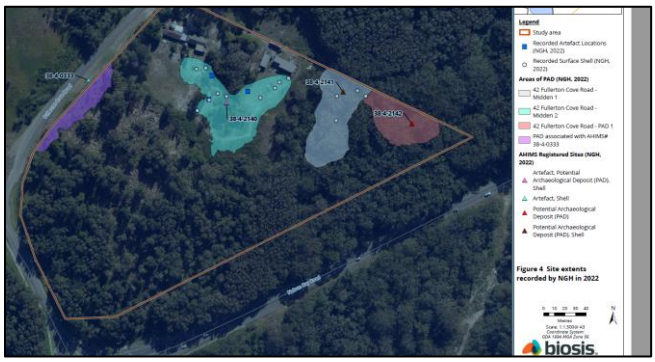
No Matters of National Environmental Significance (specifically in this instance threatened species, threatened ecological communities or listed migratory species) are expected to be impacted upon significantly as a result of the proposal, therefore, an EPBC Act Referral is considered unlikely to be required, due to the extent of the proposed development an application is being prepared.

State Environmental Planning Policy (Resilience and Hazards) 2021

Investigations in accordance with the State Environmental Planning Policy (Resilience and Hazards) 2021 (R&H SEPP) found that the Subject Site does not fall within the Proximity to Coastal Wetlands and Littoral Rainforest Area, or Coastal Use Area but does within the Coastal Environment Area Mapping.

Table - Coastal Environment Assessment

Clause Number	Clause	Assessment
13 (1)	Development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following	The site occurs within a coastal environmental area.
13 (1a)	(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,	No waterways pass through the site but a first order stream is present in the adjoining allotment and VRZ's have been applied and a CAA required. A stormwater management plan will be required to ensure that the management of water as part of the Development meets Port Stephens Council water quality targets and will not have an adverse impact on the coastal management areas. A Flood Impact and Risk Assessment will also be lodged with the DA Refer **Appendix I.** Typical water sensitive urban design is expected to be incorporated into the management of water on site and around the development, to ensure erosion does not occur and water run-off is contained and managed. A small portion of Study Area, south-west of the Subject Site, contains areas of ephemeral forested wetland supporting a *Melaleuca quinquinervia* (Broad-leaved Paperbark) and *Eucalyptus robusta* (Swamp Mahogany) community and a more permanent wetland community dominated by *Typha orientalis* (Broadleaved Cumbungi). Areas dominated by *T. orientalis* lack open water due to the density of vegetation. Avoid and minimise principals apply to all potential impacts to this area within the Subject Site and Subject Area, also applicable to the northern hydroline.
13 (1b)	(b) coastal environmental values and natural coastal processes,	The proposed development is located approx. 235m south of the foreshore and approx. 1.7km west of a coastal wetland and proximity area for coastal wetlands and will avoid direct impact on coastal environmental values and natural coastal processes.
13 (1c)	(c) the water quality of the marine estate (within the meaning of the Marine Estate Management Act 2014), in particular, the cumulative impacts of the	A stormwater management plan will be required to ensure that the management of water as part of the Development meets Port Stephens Council water quality targets and will not have an adverse impact on the coastal management areas. Typical water sensitive urban design is expected to be incorporated into the management of water on site and around

Clause Number	Clause	Assessment
	proposed development on any of the sensitive coastal lakes identified in Schedule 1.	the development, to ensure erosion does not occur and water run-off is contained and managed.
13 (1d)	(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,	The proposed development is located approx. 350m south east of Fullerton Cove foreshore and approx. 225m from coastal wetland and approx. 60m from coastal use mapping and will avoid direct impact on marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms.
13 (1e)	(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability	The proposed commercial development is located within private property and will not impact existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with disability.
13 (1f)	(f) Aboriginal cultural heritage, practices and places	There are known Aboriginal cultural heritage, practices or places associated within this Lot and no adverse impacts are expected with due diligence undertaken. Searches were carried out on the NSW Public Aboriginal Heritage Map Website which did not indicate any listing for the Subject Site.  However preliminary works undertaken indicate areas of Potential Aboriginal Deposit (PAD) (NGH 2022) have been noted for the Subject Site and an extensive search consultation with a registered Heritage Assessor is required (Heritage NSW 2022) and will be undertaken. 
13 (1g)	(g) the use of the surf zone.	The development is set back from the foreshore and is separated by agricultural land. The site will not impact or use the surf zone in the foreshore.

Clause Number	Clause	Assessment
13 (2)	Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—	
13 (2a)	(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or	The proposed development is located away from the foreshore avoiding direct impact on the coastal environmental areas.
13 (2b)	(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or	As above.
13 (2c)	(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.	As above.
13 (3)	This clause does not apply to land within the Foreshores and Waterways Area within the meaning of *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*.	Not applicable to this application.

As demonstrated in the above assessment it is likely that the proposed development will have minimal to no impact on the catchment area following the use of an appropriate Stormwater Management Plan and Water Sensitive Urban Design.

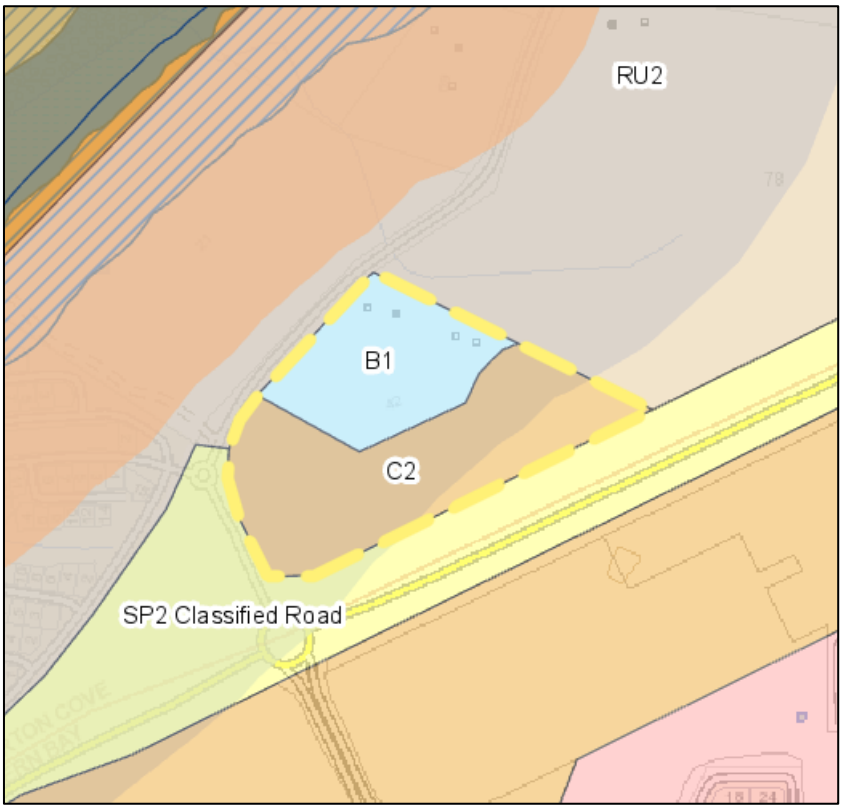


Plate 9: Coastal Environment Area Map over Study Area with proximity to Coastal Use and Coastal Wetlands mapping indicated.

Water Management Act 2000

The DPE (Water) administers the WM Act and is required to assess activities carried out on waterfront land. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40 meters of the highest bank of the river, lake or estuary. Certain activities within this land is defined as a 'controlled activity' and requires approval from the Office of Water.

There are no artificial dams or mapped hydrolines recorded within the Study Area. One (1) unnamed first order mapped hydroline is located approx. 3m north of the Subject Site that then runs into Fullerton Cove. Approx. 275m west of the Subject Site lays the Hunter Wetlands National Park.

Site investigations indicate that the closest top of bank stream measurement **is within** 3m of the Subject Site and as such there will be VRZ encroachment within the Subject Site and a Controlled Activity Approval (CAA) will be required to be submitted with the Development Application

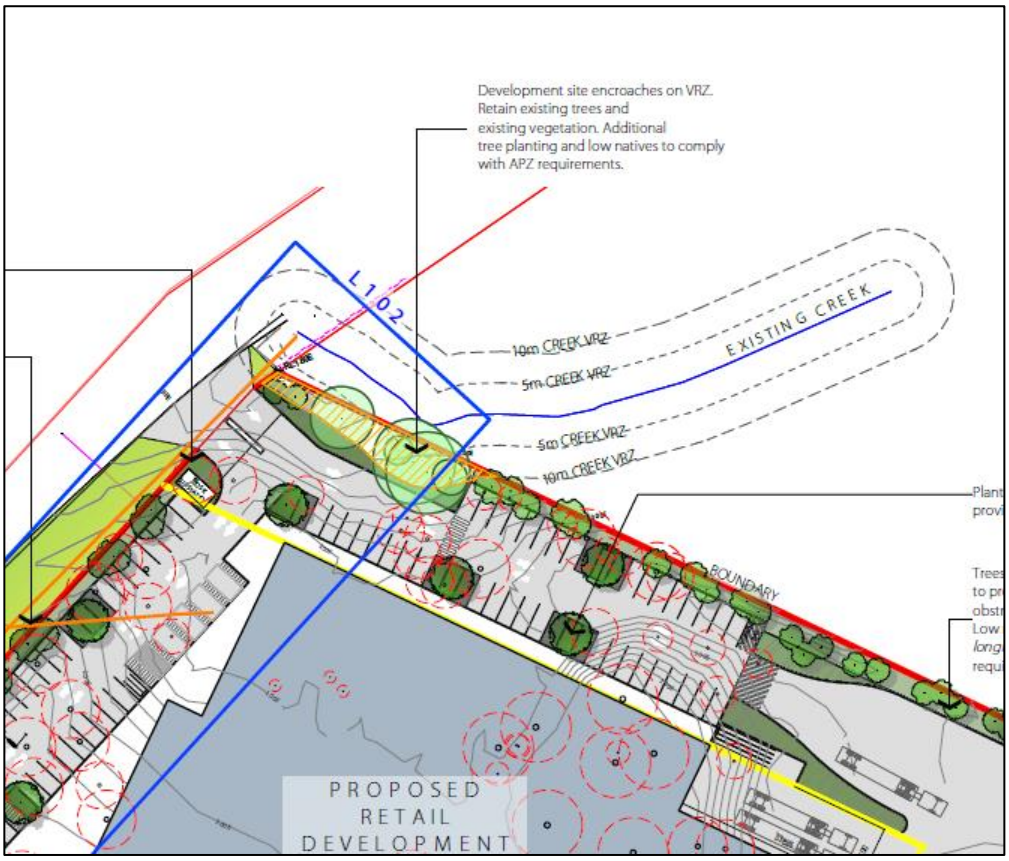
VRZ Management and Controlled Activity Approvals

Utilising *Natural Resources Access Regulator Waterfront land tool, NSW DPIE 2020* Appendix 8: NRAR Guide - Determining the high bank of watercourse;

- The first order stream does not reflect the State based mapped Hydroline position and ranges from 2.5m in width to approximately 8m where it flows through a culvert that goes under Fullerton Cove Road;

As part of the Controlled Activity Approval, the proponent will need to demonstrate that;

- Appropriate Storm Water Management, MUSIC Modelling and Water Sensitive Urban Design (WSUD) is prepared and incorporated into the design to demonstrate that water moving off the site and into the defined streams meets and exceeds the water quality requirements as per Council's guidelines;
- It is critical that the proposal manages water accordingly ensuring that the mapped waterways are not compromised as a result of the development;
- VRZ offsetting can typically be adopted along the length of a stream within the Subject Site and encroachment within the outer 50% of the VRZ can be undertaken with appropriate offsetting along the stream if available. This means in some instances the VRZ can be reduced to 5m and appropriately offset along the stream within the Subject Site; and
- The VRZ encroachment upon the Subject Site was avoided and no offsets are applicable as the impact area was removed from the Subject Site with the reduction of carpark spaces. A Landscape Plan has identified trees that will be retained with additional native's species plantings of surrounding PCT's. See below.



Landscape Plan Ex Terras landscape architects Site Plan L100 Fullerton Cove Retail

Fisheries Management Act 1994

As no natural streams or waterways are to be impacted by this development apart from a VRZ being placed within the Subject Site and no further assessment under the *Fisheries Management Act 1994* is required.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2021 (BC SEPP) commenced on the 1st March 2022, under the Environmental Planning and Assessment Act 1979, and repealing the previous State Environmental Planning Policy (Koala Habitat Protection) 2020 and State Environmental Planning Policy (Koala Habitat Protection) 2021. The aims of Chapter 4 – Koala Habitat Protection of SEPP (Biodiversity and Conservation) 2021, are to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

According to the BC SEPP 2021, the policy applies if:

4.9 Development assessment process—no approved koala plan of management for land

(1) This clause applies to land to which this Chapter applies if the land—

(a) has an area of at least 1 hectare (including adjoining land within the same ownership), and

(b) does not have an approved koala plan of management applying to the land.

Review of the information identified the site located at 42 Fullerton Cove Road, Fullerton Cove NSW has an approved Koala Plan of Management and as such the Port Stephens CKPoM applies.

Port Stephens Comprehensive Koala Plan of Management Assessment

The document is specifically intended to respond to each of the performance criteria laid out in CKPoM Appendix 4 and undertake a Koala Habitat Assessment as described in CKPoM Appendix 6.

The site was inspected by an Klienfelder ecologists in 2020 to undertake the habitat assessment, flora assessment, Spot Assessment Technique (SAT) survey (17th November 2020) and nocturnal spotlighting and call playback (20th & 24th August 2020) and further spotlighting (19th November & 16th December). The inspection included general site reconnaissance and traversal, with a view to verifying or otherwise information that had been gathered at the desktop level, and also to identify the presence of potential important ecological features. Such searches included specific examination for any signs of Koala activity on the site, using the SAT (Phillips & Callaghan, 2011), as well as nocturnal spotlighting and call playback.

Performance Criteria for Development Applications

Port Stephens Council Comprehensive Koala Plan of Management (CKPoM) (2002) contains performance criteria to assess development applications, an important means by which Koala habitat can be protected and effectively managed. All development applications in the Port Stephens LGA will be required to comply with the provisions of the Port Stephens Council CKPoM to comply with *State Environmental Planning Policy – Koala Habitat Protection 2021*. Examination of the Koala Habitat Planning Map (Port Stephens Council 2007) shows the site contains Supplementary Koala Habitat and the remaining area of Mainly Cleared Land as per the Koala Habitat Planning Map. Refer **Plate 10** PS CKPoM mapping and **Plate 11** Kleinfelder ground-truthed Koala Habitat Mapping.

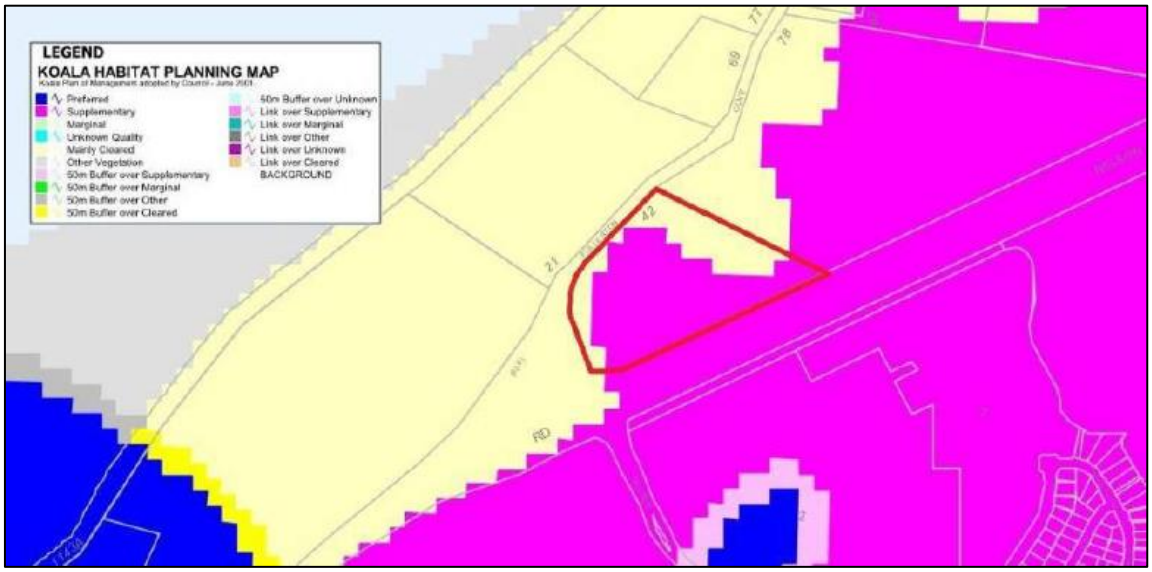


Plate 10. CKPoM Port Stephens Koala Habitat mapping for the Study Area

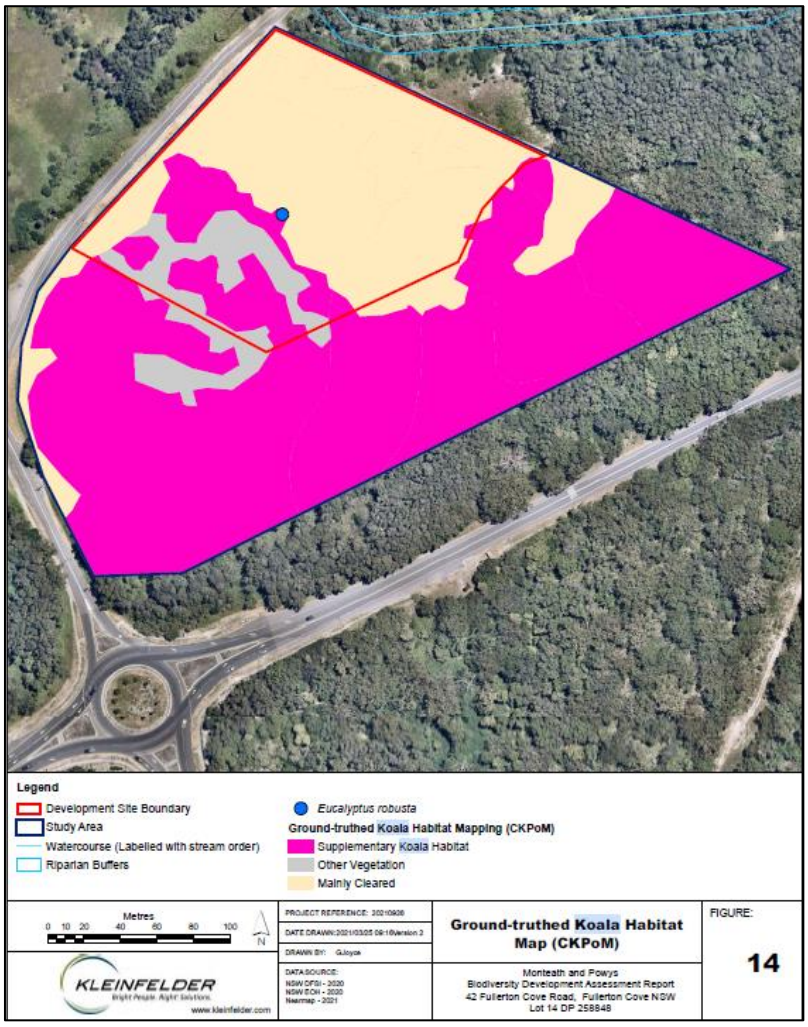


Plate 11 Klienfelder ground-truthed Koala Habitat Map

Under Appendix 4 of the CKPoM, the following information is required to accompany development applications:

An assessment of Koala habitat, by a suitably qualified person, in accordance with the attached Guidelines for Koala Habitat Assessment, which appear in Appendix 6.

Koala Habitat Assessment undertaken in **Section 2.0.**

Koala habitat within the Development Site is considered largely unsuitable for Koalas, given the majority of cleared and managed vegetation, planted and exotic tree species and portions of the Subject Site periodically inundated with water. One *Eucalyptus robusta*, listed as a preferred Koala food tree under the Port Stephens CKPoM, occurs within the Development Site. One small individual is disjunct from other vegetation and is largely surrounded by cleared land. Part of the Study Area, outside of the Development Site, contains largely undisturbed and intact Swamp Sclerophyll vegetation in which *Eucalyptus robusta* is a co-dominant overstorey species.

Clear details concerning which vegetation is to be cleared or disturbed and that which is to be retained.

The proposed development plan for the site can be found in **Appendix A**, indicating the current plan for the site which includes 2.27ha of native vegetation removal.

Details of any proposed building envelopes and fire fuel reduction zones and the means by which they are to be enforced.

Refer **Figure 1 & 2** for site location; **Appendix A** for proposed development plan and associated Asset Protection Zones. No fire fuel reduction zones apply besides associated APZs.

Proposed measures to restore or rehabilitate Koala habitat, including measures which will result in the net gain of Koala habitat.

The development plan for the site can be found in **Appendix A**. This will not have a direct impact on the existing corridors to the south east of the Subject Site. The size of the Subject Site (2.46ha) and location of the Subject Site means it is unlikely to contribute to broad scale Koala movement in the area and does not constitute PKH or SKH. A corridor of trees will remain intact to the south east of the site in the retained C2 land and a 50-metre strip of bushland that adjoins the south-eastern border of the Study Area to Nelson Bay Road which could allow for Koala movement in the area.

The vegetation within the Subject Site is not a key area for local connectivity of threatened species and does not represent an important local wildlife corridor. Habitat outside of the Subject Site, and within the Study Area, contains potentially important foraging habitat for threatened species such as the Koala (*Eucalyptus robusta* dominated vegetation). However, these areas will not be fragmented or have fragmentation increased as a result of the proposed development due to adjoining vegetation within and surrounding the Study Area. Therefore, the proposed development would not increase fragmentation on a local scale.

The landscape plan for the site should utilise species that are endemic to the area and associated with the PCT's identified on site. The proposed development plan for the site aims to avoid large areas of Supplementary Habitat that contains the preferred food tree species *Eucalyptus robusta* for Koalas in the Port Stephens LGA. The plan indicates that one (1) individual (< 30cm DBH) of *E. robusta* will be impacted due to the proposed development. The proposed development within the Subject Site is considered to have a low potential impact on Koalas, due to the small portion of Supplementary habitat proposed to be modified as a result of the proposed development. Additionally, it has been determined that the degraded nature of the majority of vegetation within the Development Site, the limited number of preferred food trees and bordering roads would not significantly increase fragmentation of Koala habitat or impact upon Koala movement. However, offset planting of Koala food trees (*E. robusta*) is recommended at 1:8 ratio, as per the replacement Koala habitat planting guideline (PC, 2014).

Proposed measures to allow the safe movement of Koalas across the site including road designs and speed mediation measures, fence construction details where fencing is proposed, and swimming pool specifications.

As stated above, the proposed development and clearing of 2.27ha of native vegetation is not going to increase fragmentation in the area and it will not have a direct impact on the existing corridors to the south east of the site. The size of the Subject Site (2.46ha), a single preferred feed tree and location of the Subject Site means it is unlikely to contribute to broad scale Koala movement in the area. A corridor of trees will remain intact to the south east of the site in the retained C2 land and a 50-metre strip of bushland that adjoins the south-eastern border of the Study Area to Nelson Bay Road which could allow for Koala movement in the area.

The type of terrain and its location on private land means only low vehicle speed will be achievable and further restricted in commercial premises. This site is fragmented from areas of Preferred Koala Habitat (PKH) and although linked to further Supplementary Habitat (SKH) located within the wider region, it is not expected to increase fragmentation in the area with the retainment of 4.24ha of SKH within the allotment. It is not considered that the proposed development will impact safe movement of Koala in the locality. No pools are proposed within the development but appropriate fencing will be addressed if this changes. Fencing needs to consider the movement of Koalas through the area and provision of access and egress points to scale fences should be

provided when chain mesh fencing is not proposed to be used. As such, no further construction measures are deemed necessary in this regard.

Proposed measures to mitigate the impacts on Koalas by dogs.

Being a commercial development, it is expected that there is a risk that dog may be on site. Such measures as engagement with owners and communication of best practice are recommended to ensure they are aware of potential risks posed by dogs and how to mitigate such risks. Clear signage may be considered.

Such measures may include the creation of a fenced-off area surrounding the Subject Site so as to limit movement into the 4.24ha of retained land where Koalas are likely to occur; and the use of a leash if venturing into this area. Additionally, the development should consider provision of Koala safe fencing that allows Koalas to freely move and climb the fence or provision of logs, ladders or something similar that will allow for Koalas to climb over a fence if necessary.

Koala Habitat Assessment

Appendix 6 of the CKPoM contains *Guidelines for Koala Habitat Assessments* in Port Stephens LGA that serve to provide the information necessary to support a development application being considered under Part 4 of the EP&A Act. Application of these guidelines will also substantially contribute to consideration of the impact of a proposed development on Koalas or their habitat as required under the *Biodiversity Conservation Act* (BC Act) (which has superseded s.5A of the EP&A Act).

Preliminary Assessment

A review of the Koala Habitat Planning Map for the Port Stephens LGA, indicates that the site is predominately mapped as “Supplementary Koala Habitat” with the remainder mapped as “Mainly Cleared Land” and connected to “Supplementary Koala Habitat” to the south east of the Subject Site.

General assessment on site and desktop analysis indicates that to the north and west of the site land is zoned RU2 Rural Landscape. To the east and the south, land is zoned SP2 Infrastructure-Classified Road as it adjoins Nelson Bay Road and Fullerton Cove Road respectively The Subject Site has been re-zoned from RU2 to B2 Neighbourhood Centre and the Study Area is zoned to C2 Conservation Management. The Subject Site has been developed in line with current zonings and is in a location where removal of the vegetation on site will not impact any key corridors in the near vicinity. Major corridors that would be facilitating Koala movement in the area are maintained in the C2 zoned lands.

Further to this ground-truthing native vegetation on site revealed that the Subject Site contains one *Eucalyptus robusta* (Swamp Mahogany), as listed as a preferred Koala food tree under the Port Stephens CKPoM along with *Eucalyptus parramattensis* (Parramatta Red Gum) and *Eucalyptus tereticornis* (Forest Red Gum). One small individual is disjunct from other vegetation and is largely surrounded by cleared land. Part of the Study Area, outside of the Development Site, contains largely undisturbed and intact Swamp Sclerophyll vegetation in which *Eucalyptus robusta* is a co-dominant overstorey species. Therefore, the site would marginally constitute SKH.

Additionally, a desktop assessment was carried out within the broader landscape to determine if the site provides a moderate level of connectivity to the areas of PKH within the Port Stephens locality. The desktop assessment identified that the vegetation surrounding the site is predominantly SKH to the south east and Mainly Cleared Land to the north and west. There are small fragmented areas of “Preferred Koala Habitat” (PKH) occurring to the north east, south and south west (refer **Plate 12**). However, the location of the development and proposal to remove 2.28ha of vegetation will not have an impact on Koala movement in the area.

The Subject Site is in a location where major corridors are still intact to the south east of the site and as such the proposed development will not contribute to reducing connectivity for Koalas to other areas of PKH or SKP in this general locale.

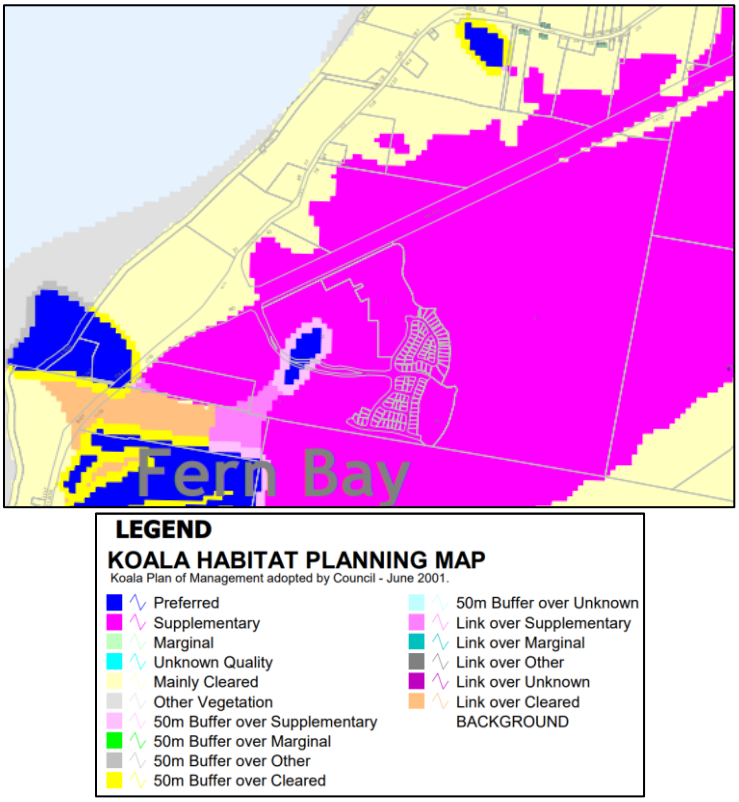


Plate 12 Broader landscape Koala Habitat Mapping

Vegetation Mapping

Mapping has been prepared for the Subject Site using the regional vegetation mapping produced by SEWPaC (2013) as well as ground truthing of the site. Four Plant Community Types (PCT's) were found to occur on site, with PCT 1717 *Broad-leaved Paperbark - Swamp Mahogany - Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* vegetation containing *Eucalyptus Robusta.* This area constitutes 0.11ha in a managed condition within the Subject Site. Part of the retained Study Area (4.24ha) contains largely undisturbed and intact Swamp Sclerophyll vegetation in which *Eucalyptus robusta* is a co-dominant overstorey species.

A total of 2.27ha of native vegetation is proposed to be cleared which includes one (1) individual (< 30cm DBH) of *E. robusta* that will be impacted due to the proposed development, thus, leading to a very minimal reduction in vegetation. Given the location of the Subject Site, zoning, condition- and vegetation present; it is not currently expected to be utilised as a vegetation corridor supporting Koala mobility. For a site-specific vegetation map refer **Figure 4**.

Koala Habitat Identification

A portion of the Subject Site is mapped "Marginal Koala Habitat" and one *Eucalyptus robusta*, listed as a preferred Koala food tree under the Port Stephens CKPoM, occurs within the Subject Site. One small individual is disjunct from other vegetation and is largely surrounded by cleared land. No areas of Preferred Koala Habitat or defined Habitat Buffers are mapped within the Subject Site or within the Study Area. Potential impacts to Koalas from the proposed rezoning are considered to be negligible. The proposed development within the Subject Site is considered to

have a potential low impact to Koalas, given that a small portion of Supplementary habitat within PCT 1717 would be modified as a result.

Assessment of Proposal

The site of the proposed development is situated within land known identified as Lot 14 DP 258848 (Subject Site) located at 42 Fullerton Cove Road, Fullerton Cove in the Port Stephens Local Government Area. Approximately 2.28ha of native vegetation is proposed to be cleared for the construction of a commercial development. The site is predominately mapped "Supplementary Koala Habitat" and vegetation surrounding the site is predominantly SKH to the south there are small fragmented areas of (PKH) occurring to the north east, south and south west. These PKH areas are not connected to the Subject Site, only "Supplementary Koala Habitat" and "Mainly Cleared Land" is connected. There are no major corridors within the Subject Site and as such the proposed development will not contribute to reducing connectivity for Koalas to other areas of PKH or SKH in this general locale. Therefore, it is not considered that the proposed development will not impact safe movement of Koala in the locality.

The development will require a full site clearance although the size of the Subject Site (2.46ha) and the minimal amount of native vegetation proposed to be removed in mostly a severely degraded condition as a result of the development (2.27ha) means there will be a relatively low impact compared with other potential locations within the surrounding area.

Broader tracts of native vegetation mostly to the south east of the site that are connected to the C2 land within the Study area (4.24ha) will facilitate movement of Koalas in the area and removal of the native vegetation from the Subject Site is likely to restrict the movement of Koalas into the development areas meaning that there will be a reduced impact for vehicle strike and interactions with the local domestic animal population. The proposed development for the site is unlikely to increase vehicle strikes within the Subject Site as the proposed development is located within an already mostly cleared setting.

As the Subject Site occurs within an already disturbed and developed landscape, and has already been previously disturbed, it is considered unlikely that impacts to 'Koala Habitat' will be of a notable magnitude from the proposed development. It is reiterated here that the removal of a small individual preferred Koala feed tree species is unlikely to impact the Koala population. Additionally, offset planting of Koala food trees (*E. robusta*) is recommended at 1:8 ratio, as per the replacement Koala habitat plantings guideline (PSC, 2014). Replacement plantings should be focused within retained habitat within the Study Area, i.e. *PCT 1717 - Broad-leaved Paperbark - Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast*.

One SAT survey, spotlighting and call play back were carried out within the Subject Site. One individual of Swamp Mahogany (*Eucalyptus robusta*) but no Parramatta Red Gum (*Eucalyptus parramattensis* subsp. *decadens*), or Forest Red Gum (*Eucalyptus tereticornis*) were found on site. No Koala scats or scratching's were found during SATs. Further to this, no Koalas were identified on site during the survey period. Given the small size of the site it is considered unlikely that current Koala activity within the site would go undetected.

An assessment of the proposal has found that it has the ability to meet the performance criteria laid out in CKPoM. Consideration of the existing state of the site (previously cleared and susceptible to edge effects).

The location of the proposed development is within a landscape whereby there is better quality vegetation and corridors to the south east of the site and within the retained C2 land.

The development won't be impacting areas that contribute to the connectivity of PKH or good quality SKH in the area due to the already degraded nature of majority of the vegetation within the Subject Site, limited number of preferred food trees (one *E. robusta*) and bordering roads (Fullerton Cove Road and Nelson Bay Road).

It was determined that the proposed development will not compromise the quality or integrity of surrounding habitat and is not likely to impede or hinder Koala movement or fragment habitat in the area.

In conclusion it has been determined that given the Subject Site's small size, low levels of Koala records in the immediate vicinity and the remaining native vegetation patch and connectivity in the locality, the proposed development is not likely to impact on existing Koala population within the region. The small amount of vegetation removal to be undertaken may be negated by supplementary native planting and if not the large areas of high quality contiguous off-site vegetation will ensure that the Port Stephens Koala population will not be negatively impacted by the development.

Port Stephens Council Local Environmental Plan 2013

The Port Stephens Local Environmental Plan, 2013, (LEP) commenced on 22 February 2014. The aim of the LEP

The particular aims of this Plan are as follows:

to protect and promote the use and development of land for arts and cultural activity, including music and other performance arts,

to implement the community's Port Stephens Futures Strategy 2009 and Port Stephens Planning Strategy 2011,

to cultivate a sense of place that promotes community wellbeing and quality of life,

to provide for a diverse and compatible mix of land uses supported by sound planning policy to deliver high quality development and urban design outcomes,

to protect and enhance the natural environmental assets of Port Stephens,

to continue to facilitate economic growth that contributes to long-term and self-sufficient employment locally,

to provide opportunity for housing choice and support services tailored to the needs of the community,

to conserve and respect the heritage and cultural values of the natural and built environments,

to promote an integrated approach for the provision of infrastructure and transport services,

to continue to implement the legislative framework that supports openness, transparency and accountability of assessment and decision making, and

to achieve intergenerational equity by managing the integration of environmental, social and economic goals in a sustainable and accountable manner.

The assessment in **Table 31** assesses relevant ecological clauses within the LEP to ensure the aims of the LEP can be achieved.

Table 30: LEP Assessment

Clause Number	Clause	AEP Assessment
Land Use Table		
1	**Zone B1 Neighbourhood Centre - Objectives of zone**	
	To provide a range of small-scale retail, business and community uses that serve the needs of people who live or work in the surrounding neighbourhood.	The proposed development will meet all of these objectives and are addressed in the SEE.
2	**Permitted without consent** - Home occupations	N/A
3	**Permitted with consent** - Amusement centres; Attached dwellings; Boarding houses; Boat building and repair facilities; Boat launching ramps; Boat sheds; Business premises; Car parks; Charter and tourism boating facilities; Centre-based child care	The proposed development is to permitted with consent – commercial premises

Clause Number	Clause	AEP Assessment
	facilities; Commercial premises; Community facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Function centres; Health consulting rooms; Home-based child care; Home businesses; Hostels; Information and education facilities; Jetties; Light industries; Medical centres; Neighbourhood shops; Neighbourhood supermarkets; Oyster aquaculture; Passenger transport facilities; Places of public worship; Public administration buildings; Recreation areas; Recreation facilities (indoor); Registered clubs; Respite day care centres; Roads; Service stations; Shop top housing; Signage; Tank-based aquaculture; Tourist and visitor accommodation; Vehicle body repair workshops; Vehicle repair stations; Veterinary hospitals; Water recreation structures; Water reticulation systems	
4	Farm stay accommodation; Landscaping material supplies; Pond-based aquaculture Rural supplies; Specialised retail premises; Timber yards; Any other development not specified in item 2 or 3	N/A
Part 7 Additional Local Provisions		
7.9	**Wetlands**	
7.9 (1)	The objective of this clause is to ensure that wetlands are preserved and protected from the impacts of development.	The proposed development has been positioned primarily within the unmapped wetland areas of the Study Area with 4.24ha zoned as C2- Environmental Conservation. The Study Area (including parts of the Subject Site) contain small patches of wetland complex and areas of forested wetlands which are periodically inundated. Majority of the Subject Site has historically been cleared of native vegetation and managed regularly. Alterations to the topography of the site has likely resulted in changes to the hydrological regime which have likely affected these areas of forested wetlands and wetland complex. Impacts to Freshwater Wetlands EEC will be limited to 0.27ha within land when rezoning occurred to *B1: Neighbourhood Centre* (Subject Site). A total of 0.22ha will be retained as part of the proposed rezoning of land from *RU2: Rural Landscape* to C2*: Environmental Conservation*. Additionally, the rezoning of land from *RU2: Rural Landscape* to C2*: Environmental Conservation*, good

Clause Number	Clause	AEP Assessment
		condition vegetation (PCT 1717) likely commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, will be retained. Retained vegetation containing good structural complexity, especially moderate condition PCT 1717 and moderate condition PCT 1646, likely provides suitable foraging and potential roosting habitat for the Powerful Owl (*Ninox strenua*) a threatened species detected outside of the Development Site during surveys. A portion of the vegetation within the west of the Study Area and Development Site has been identified in the BOM Groundwater Dependent Ecosystem Atlas as high potential Groundwater Dependent Ecosystems (GDE). Direct impacts to this vegetation would be offset via the ecosystem credit requirement. Indirect impacts to vegetation, and in the adjacent lot to the north-east, also mapped as high potential for GDE, would be avoided and minimised through the implementation of appropriate measures. Given the proximity of the proposed development to the Hunter Estuary Wetlands, A Storm Water Management Plan will be prepared for the proposed development. Therefore, it has been determined that the biodiversity within the Study Area will significantly improve and be protected.
7.9 (2)	This clause applies to land identified as "Wetland" on the Wetlands Map.	Proportion of the Subject Site are mapped wetlands (refer below).  The areas that are mapped in the LEP as wetlands have been ground-truthed and is predominately PCT 1717 and 1737 in poor and moderate conditions respectively. A total of 0.46ha of vegetation is commensurate with *Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland* EEC and 0.27ha is commensurate with *Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* EEC refer **Figure 4** in the BDAR, confirming a proportion of the above map

Clause Number	Clause	AEP Assessment
		as wetlands. The variation and areas ground-truthed as PCT 1646 may be as result of scale to which the LEP was created and / or no ground – truthing or changes to the hydrolines located in the northern adjoining allotment. The BDAR has assessed each PCT within the impact area and associated credits for both ecosystem and species have been applied.
7.9 (3)(a)(i)	Before determining a development application for development on land to which this clause applies, the consent authority must consider — whether or not the development is likely to have any significant adverse impact on the following— The condition and significance of the existing native fauna and flora on the land.	The Biodiversity Assessment Report for this development took into consideration the condition, ecological value and significance of flora and fauna present within the site to determine the likely impact of works. Any development will incur impacts to threatened species, this development has undertaken to avoid and minimise impacts to threatened flora and fauna based on design iteration, location, type of habitat and retention of Environmental Conservation land in the south east to act as both a sanctuary and corridor for biodiversity connectivity. Following these considerations, it is considered that the development as it stands is unlikely to cause significant impacts on any threatened species such that it would be placed at risk of extinction and further that offsets will be provided to compensate for the impacts that could not be avoided.
7.9 (3)(a)(ii)	The provision and quality of habitats on the land for indigenous and migratory species,	The Environmental Conservation land will improve the wildlife corridors through the preservation and natural regeneration.
7.9 (3)(a)(iii)	The surface and groundwater characteristics of the land, including water quality, natural water flows and salinity	Through compliance with Port Stephens Council stormwater and flooding controls the proposed development has limited the impacts to both surface and groundwater flows within the Subject Site. Providing protection for surrounding Environmental Conservation lands.
7.9 (3)(b)	Any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.	Avoid and minimise has been considered and implemented throughout the investigation and design process, and the latest iteration of the proposed development plan has sought to redesign to accommodate a VRZ for a hydroline positioned in the adjoining allotment. The proposed native vegetation identified for retention within Environmental Conservation land will be maintained with some offset planting proposed due to the removal of one preferred feed tree species for Koala.
7.9 (4)	Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—	Avoid and minimise has been considered and implemented throughout the investigation and design process, and the latest iteration of the proposed development plan has sought to redesign to accommodate a VRZ for a hydroline positioned in the adjoining allotment. The proposed native vegetation identified for retention within Environmental Conservation land will be maintained with some offset
7.9 (4)(a)	The development is designed, sited and will be managed to avoid any significant adverse environmental impact, or	

Clause Number	Clause	AEP Assessment
7.9 (4)(b)	If that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or	planting proposed due to the removal of one preferred feed tree species for Koala.
7.9 (4)(c)	If that impact cannot be minimised—the development will be managed to mitigate that impact.	
LEP Dictionary - wetland		
(a)	Natural wetland, including marshes, mangroves, backwaters, billabongs, swamps, sedgelands, wet meadows or wet heathlands that form a shallow waterbody (up to 2 metres in depth) when inundated cyclically, intermittently or permanently with fresh, brackish or salt water, and where the inundation determines the type and productivity of the soils and the plant and animal communities	The wetlands meet the definition of a natural wetlands, however, considering the history of the Subject Site with prior clearing, it has been determined that the wetlands located within the site have been modified in the past.
(b)	Artificial wetland, including marshes, swamps, wet meadows, sedgelands or wet heathlands that form a shallow waterbody (up to 2 metres in depth) when inundated cyclically, intermittently or permanently with water, and are constructed and vegetated with wetland plant communities.	N/A

Port Stephens Council Development Control Plan 2014

The Development Control Plan, 2014, (DCP) commenced in 2014, the aim of the DCP is to facilitate development in accordance with the LEP. **Table 32** assesses the relevant ecological clauses within the DCP demonstrating compliance.

Table 31: DCP Assessment

Clause Number	Clause	AEP Assessment
Development Control Plan 2014		
B2.1	Development located on land or is within 500m of land that contains items of environmental significance, such as threatened species or communities, listed migratory species, wildlife corridors, wetlands or riparian corridors and has the potential to impact biodiversity provides:	The proposal triggers the BOS; hence a Biodiversity Development Assessment Report is required, no further assessment of Clause B2.1 is required.
	A flora and fauna survey to inform the assessment of significance.	
	The flora and fauna survey is in accordance with: NSW Department of Environment and Conservation. 2004, 'Threatened Species Survey and Assessment: Guidelines for development and activities Hunter and Central Coast Regional Environmental Management Systems. 2002, 'Lower Hunter and Central Coast Regional Fauna and Flora Guidelines'9	
	If development poses a significant effect under 5A of the EP&A Act or if development is on land which is, or is part of, critical habitat then a species impact statement (SIS) is required	
	If development does not pose a significant effect under 5A of the EP&A Act, but proposes unavoidable vegetation impacts then a vegetation management plan (VMP) that is consistent with the vegetation technical specification2 is required. Note: Under section 5.5 of the EP&A Act the determining authority has a duty to consider the environmental impact of proposed activities	
	If the flora and fauna survey propose the removal of hollow bearing trees then a hollow tree assessment is required:	
	Two replacement hollows are provided for each hollow tree	

Clause Number	Clause	AEP Assessment
	identified by the hollow tree assessment	
	Salvaged hollows are preferred over nest boxes that are consistent with the nest box technical specification	
	Note: This is consistent with B1.7 that requires a hollow tree assessment to remove hollow bearing trees on land to which B1 applies	
	A proposed buffer on the land subject to the development is provided to items of environmental significance. The width of the buffer is recommended by the flora and fauna survey report based and is based on taking into account the following parameters:	
	The condition of the item of environmental significance	
	Proposed methods of mitigating adverse impact	
	Possible external effects, such as weed encroachment or domestic animals and their potential to cause impact	
	Where the vegetation of buffers are proposed, the vegetation is established along the relevant boundaries prior to the issuing of the relevant subdivision or occupation certificate	
B2.B	Biodiversity offsets	Refer Section 2.4.2.1 and 2.4.2.2
	If biodiversity offsets are employed as a suitable compensatory measure under the TSC Act then they are:	
	Calculated in accordance with the bio-metric terrestrial biodiversity assessment tool	
	Consistent with the vegetation technical specification in a secure tenure ownership	
	Located on land to which this Plan applies	
B2.C	**Noxious weeds**	
	Development situated on land that contains noxious weeds, as identified by a section 64 certificate under the Noxious Weeds Act 1993 will seek to prevent, eliminate or	The development will reduce the level of noxious weeds present in the degraded Subject Site with hygiene and sanitation protocol recommendations made during development.

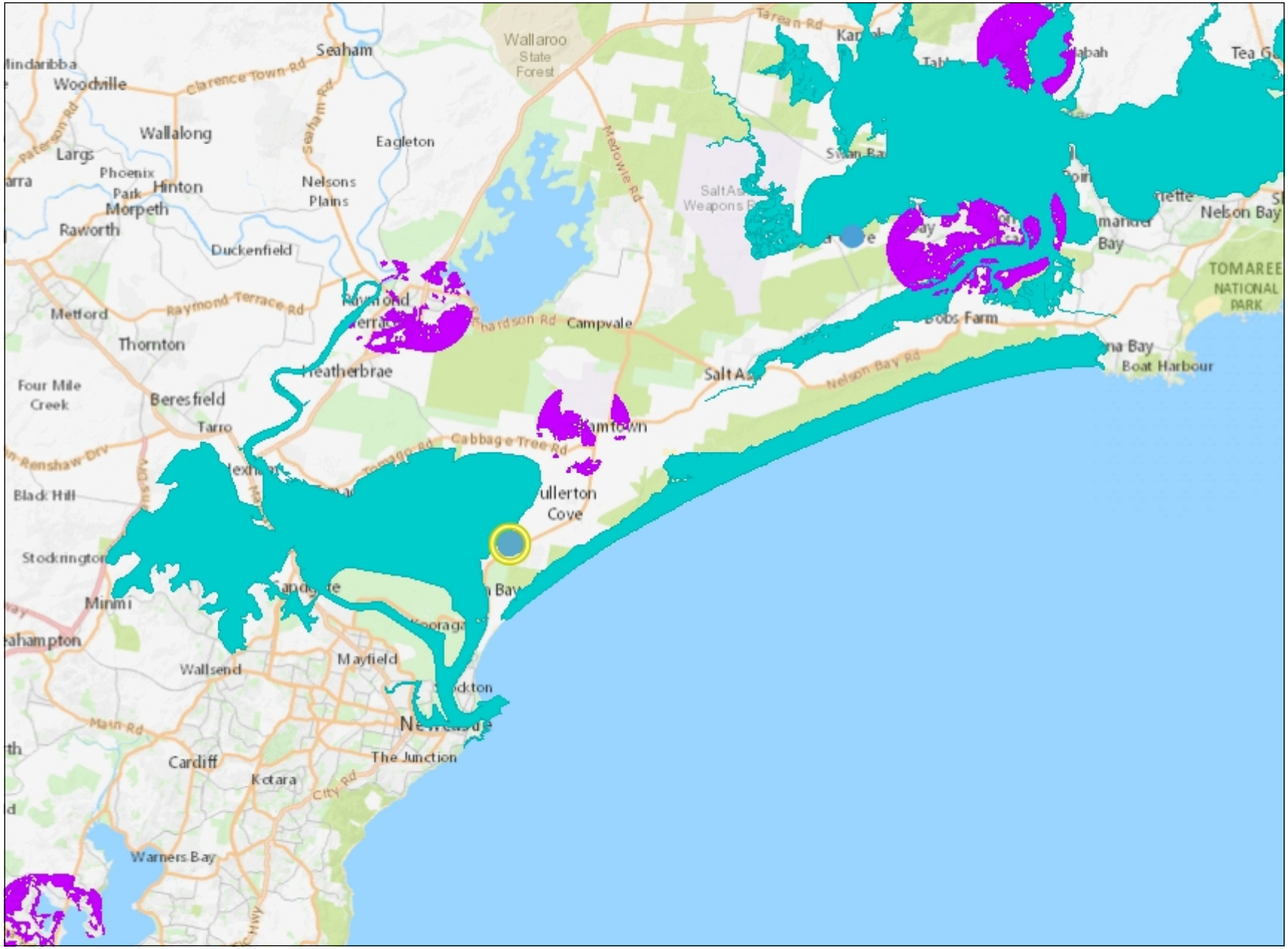
Clause Number	Clause	AEP Assessment
	restrict the spread of noxious weeds in accordance with noxious weeds technical specification	
B2.D	**Koalas**	
	Development located on or in proximity to land identified as koala habitat complies with the Port Stephens Comprehensive Koala Plan of Management10 through consideration to the performance criteria, being:	Refer to detailed Comprehensive Koala Assessment
	Minimising the removal or degradation of native vegetation within preferred koala habitat or supplementary koala habitat	
	Maximising the retention and minimising degradation of native vegetation within supplementary habitat, habitat buffers and habitat linking areas	
	Minimising removal of any individual preferred koala feed trees	
	Where appropriate, restore and rehabilitate koala habitat/buffers and linking areas	
	Removal of koala habitat is off-set by a net gain of koala habitat on-site or adjacent	
	Make provision for long-term management of both existing and restored koala habitat	
	Not compromise the safe movement of koalas, through	
	Maximisation of tree retention	
	Minimising barriers for movement, such as fences	
	Restrict development to defined building envelopes	
	Minimising the threat to koalas from dogs, motor vehicles and swimming pools	
	Development demonstrates consideration to the performance criteria within the statement of environmental effects (SEE) by providing the following:	
	A statement of environmental effects (SEE) by providing the following: - Assessment of koala habitat in accordance with Appendix 6 – Guidelines for Koala Habitat Assessment of the Port	

Clause Number	Clause	AEP Assessment
	Stephens Comprehensive Koala Plan of Management	
	Site analysis plan indicates vegetation to be disturbed, cleared or retained	
	Illustration of the Asset Protection Zone (APZ)	
	Proposed measures for the safe movement of koalas, such as fencing or traffic control measures	
	Details of any programs to monitor koala populations	
	Note: The Port Stephens Comprehensive Koala Plan of Management10 applies through the application of the SEPP (Koala Habitat Protection) 2019	
B4.D	**Riparian Corridors**	
B4.11	Development involving a controlled activity within waterfront land (within 40m from the highest bank of the river, lake or estuary) adheres to the Water Management Act 2000.	The northern adjoining allotment has a first order stream and site investigations indicated that the closest top of bank stream measurement is within 10m of the Subject Site and as such there will be VRZ encroachment within the Subject Site and a Controlled Activity Approval (CAA) will be required to be submitted with the Development Application. Further amendments to the development design was made to ensure that no impact within the VRZ is applicable and offsetting is not required.
B4.12	Development provides the following buffers to riparian corridors that are generally consistent with the recommendations of the NSW Office of Water. 2012, 'Guidelines for riparian corridors on waterfront land	
	50m buffer from 3rd order water courses or above with a 40m vegetated riparian zone and 10m vegetated buffer	
	30m buffer from 1st-2nd order water courses with a 20m vegetated riparian zone and 10m vegetated buffer	
'B4.13	Riparian corridors are dedicated as public open space when Council agrees to take ownership of that land	

Appendix H – Important Areas Map

Planning, Industry & Environment

3063



Legend

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

0 11.0 22.0 44.0

Kilometres

Map Created 1:34 PM 11/10/2023

Appendix I – Flooding & Stormwater Management Plan

NORTHROP

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Flooding & Stormwater Management Plan

for

42 Fullerton Cove Road, Fullerton Cove

for

Monteath and Powys Pty Ltd

NL161067 / 13 September 2023 / Revision A

Level 1, 215 Pacific Highway
Charlestown NSW 2290
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Contents

Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALS	Airborne Laser Survey (LiDAR)
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff 2019
BoM	Bureau of Meteorology
DCP	Development Control Plan
DTM	Digital Elevation Model
FPL	Flood Planning Level
LGA	Local Government Area
LiDAR	Light Detection and Ranging (also see ALS)
m	Measure of length / height / distance (metres)
m AHD	Meters above Australian High Datum
m/s	Measure of velocity (metres per second)
m^3/s	Measure of flow rate (cubic metres per second)
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
TUFLOW	Two-dimensional hydraulic modelling software

1. Introduction

1.1. General

Northrop Consulting Engineers have been engaged by Monteath and Powys to prepare a Stormwater and Flooding Management Plan for the proposed retail development at 42 Fullerton Cove Road, Fullerton Cove. The development proposes the construction of a new shopping complex containing a Woolworths Supermarket and various other tenancies. The centre will be serviced by a carpark with two vehicular access points off Fullerton Cove Road.

The purpose of this engineering report is to address civil engineering and stormwater items associated with the proposed development of the site, in particular:

- Stormwater collection.
- Stormwater quantity control.
- Stormwater quality control.
- Flood behaviour and risk.
- Flood impact.

The flood risk assessment aims to consider the existing flood risk, and likely changes to that risk due to the proposed development, and the proposed implementation of Council's policies relating to flood management.

Contained herein is a description of the subject site and development, and a summary of the stormwater quality and quantity and flooding assessments.

This report should be read in conjunction with the engineering drawings provided in Appendix A. This report intends to discuss items relating to the site at a level appropriate for a Development Application submission. It does not attempt to provide detailed design solutions to all issues, rather it will investigate the feasibility of solutions based on information that we have gathered from various sources and provide outcomes which will be developed further at Construction Certificate and Constructions phases of the project.

1.2. Site Description

The proposed development is located within the Port Stephens Council (PSC) Government Area and covers approximately 6.86ha. The site is illustrated in Figure 1 overleaf and is bounded by a rural residential property to the north-east, Fullerton Cove Road to the west and Nelson Bay Road to the south. The site is currently used for residential purposes, facilitating a house and sheds located predominantly in the northern corner.

Following rezoning of the site, the proposed retail development, hereafter referred to as 'the site', has an associated B1 Neighbourhood Centre boundary area of approximately 2.47 ha, external to this within the lot area exists E2 Environmental Conservation area. Soils in the area have been observed to vary between loamy sands at higher elevations, to clays in the lower areas to the south-east.

The site is low lying and generally flat for the southern and western portions, with elevations in the order of 1-2m AHD. A ridgeline runs along the north-western bound with the existing buildings on a pad at approximately 3m AHD and maximum.

Majority of the site currently drains to the south-west through a 450mm diameter RCP under Fullerton Cove Road. Runoff then passes through the TFNSW road reserve and into Lot 1 DP270695 "The Cove Village". A drainage easement through the village directs water through three 900mm diameter pipes under the Cove Drive towards Fullerton Cove.

Additionally, an existing watercourse has been identified to the north of the site on Lot 19 DP606361 (78 Fullerton Cove Road), which appears to convey flows under Fullerton Cove Road via a headwall prior to discharging to Fullerton Cove.

1.3. Proposed Development

The proposed development generally includes a new single storey shopping complex, carparking, loading dock and landscaping. Earthworks are proposed to raise the building platform to the flood planning level and ensure adequate fall across the site.

Compensatory cut is proposed to limit flood impacts of the development with an approximate area of 2,130m² and an invert level approximately of 1.25 m AHD.

The proposed civil design surface, building footprint (FFL 2.90m AHD, retaining wall extents and carparking are presented in Figure 2 overleaf, and in the Civil Drawings presented in Appendix A.

Legend

- Subject Site
- Cadastre

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Figure 1

Locality

42 Fullerton Cove Road
Fullerton Cove

NORTHROP

14/7/2023 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES2\NL161067_REV3_Figures.qgz

Data Source: NSW LPI - Cadastre, Virtual Earth - Aerial

Legend

- Subject Site
- Cadastre
- Proposed Building
- Carpark Marking
- Retaining Wall

Proposed Landform(mAHD)

- <= 1.7
- 1.7 - 2.0
- 2.0 - 2.3
- 2.3 - 2.6
- 2.6 - 3.0
- 3.0 - 3.3
- > 3.3

0 30 60 Metres

1:2,000

Figure 2

Proposed Development

42 Fullerton Cove Road
Fullerton Cove

NORTHROP

13/9/2023 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES2\NL161067_REV4_Figures.qgz

Data Source: NSW LPI - Cadastre, Virtual Earth - Aerial

2. Stormwater Management Strategy

2.1. General Requirements

The stormwater management system adopted is generally in accordance with the following:

- PSC's 2014 Development Control Plan (DCP), in particular:
  - Part B4 – Drainage and Water Quality.
- PSC's 0074 Stormwater Drainage Development Design Specification.
- Relevant Australian Standards.
- MUSIC Modelling Guidelines for South East Queensland (2010).

2.2. Area Summary

- Total site area = 24,700m^2
- Total development footprint = 22,570m^2
- Compensatory cut area = 2,130m^2
- Post-developed impervious area = 20,560m^2 (91.1%)
  - Total roof area = 8,470m^2
  - Total hardstand area = 12,090m^2
- Pervious area = 2,010m^2

2.3. Point of Discharge

The proposed development shall maintain the current intent of stormwater discharge from the site and convey the majority of the site's internal stormwater network to the existing Ø300 RCP discharge point to the south-west via overland flow. A portion of the proposed development hardstand and landscaped area (approximately 3,200m^2) is proposed to discharge to the northern watercourse via a headwall located within the site boundary. Which is comparable to the existing scenario based on survey levels.

2.4. Proposed Development Stormwater Philosophy

The following stormwater management strategy has been undertaken with considerations given to PSC's directions during the pre-lodgement meeting on 31 October 2022, and in accordance with PSC's DCP requirements. The stormwater philosophy can be summarised as follows, and should be read in conjunction with design drawings and Appendix B – Catchment Plan:

- Drainage from the northern section of staff parking will be captured by a pit and pipe network containing proprietary Ocean Protect pit inserts (or approved equivalent) prior to further treatment from a Jellyfish Filter device. The north-western portion of carpark pavement will be conveyed to a bioretention basin via a landscaped swale. These carpark and landscaped areas are proposed to discharge into the existing watercourse to the north via a concrete headwall with scour protection at the outlet to the pipes.

- Stormwater runoff from the eastern and southern areas of carpark are to be treated by a combination of pit inserts, an Ocean Protect Jellyfish Filter and both proprietary (utilising Ocean Protect Filterra) and standard bioretention basin systems. Ultimately discharging to a series of flat-based swales acting as a level spreader within the compensatory flood storage area at RL1.25m AHD and draining to the southern discharge point.
- Roof runoff shall be split and directed to an above and below-ground rainwater reuse storage system with a total volume of 65kL, located on the northern and southern side of the building, respectively. Harvested water is proposed to be reticulated internally for toilet flushing and externally for landscape irrigation. Overflow from the northern tank shall be conveyed to the Ocean Protect Filterra bioretention system and the southern to a Jellyfish device for further treatment prior to discharging to the southern discharge point.
- A small portion of the proposed northern driveway pavement will bypass all treatment measures and discharge into the northern watercourse.

2.4.1. Stormwater Quality

In order to minimise adverse impacts upon the downstream water ecology and aquatic ecosystems, Water Sensitive Urban Design (WSUD) principles have been implemented into the design. The water quality reduction targets as specified in PSC's DCP are shown in Table 1.

Table 1 - Required Water Quality Reductions

Pollutant Criteria	Required Stripping Target (%)
Total Suspended Solids (TSS)	90
Total Phosphorous (TP)	60
Total Nitrogen (TN)	45
Gross Pollutants	90

The site's stormwater quality management has been modelled in MUSIC (Version 6.3) to ensure the proposed treatment train for the development meets the above Council's stormwater quality stripping targets. Modelling was completed in accordance with PSC's DCP, Section B4.C Water Quality and PSC's "Water Sensitive Development Strategy Guidelines" (BMT WBM, 2011). The catchment areas as shown in Appendix B, included only the proposed works and excludes the compensatory cut area.

The following is a summary of the water quality treatment train that has been utilised in the MUSIC model:

Stormwater runoff from 2,110m^2 of northern carpark pavement and landscape area will be conveyed an Ocean Protect Jellyfish device via a pit and pipe network containing 3 OceanGuard pit inserts, prior to discharging to the northern watercourse. 1,070m^2 of north-western carpark area will be conveyed to a minimum 15m^2 biofilter media with an associated 150mm extended detention via a landscape swale. Overflow from the basin shall discharge into the northern watercourse via a concrete headwall.

4,235m^2 of roof runoff will be conveyed to a proposed 32.5kL below-ground rainwater tank located within the southern portion of carpark. Overflow from the tank is to discharge into the proposed Ocean Protect Jellyfish device located within the southern carpark.

4,235m^2 of roof runoff will be conveyed to a proposed 32.5kL above-ground rainwater tank located adjacent to the proposed Woolworths loading dock. Overflow from the tank is to discharge into the proposed Ocean Protect Filterra bioretention system located within the north-eastern landscape area adjacent the loading dock.

1,330m^2 of carpark hardstand and landscape shall be treated by a bioretention basin with a minimum of 30m^2 of filter media and 100mm extended detention located in the south-west corner of the site, adjacent to the motorbike parking.

The southern section of carpark is proposed to be managed by a total of 9 OceanGuard pit inserts with 1,830m^2 of hardstand and the below-ground rainwater tank being further treated by an Ocean Protect Jellyfish device. The other 3,360m^2 of southern carpark pavement and landscape discharging directly into a series of flat-based swales located within the southern compensatory cut area.

The loading dock pavement and landscape (2,400m^2) is proposed to be conveyed to an Ocean Protect Filterra Bioretention system via overland flow with minimum 40m^2 filter area and 150mm of extended detention. The above-ground rainwater tank shall also discharge into this system.

Stormwater runoff from 1,340m^2 of eastern carpark shall be catered for by a series of 4 Ocean Protect Filterra systems, each with minimum 5m^2 filter area and 150mm extended detention. Whilst the remaining 580m^2 shall be conveyed to a landscape swale via overland flow and down to the compensatory cut level.

A small portion of the proposed carpark driveway (80m^2) will bypass all treatment measures and discharge into the northern watercourse via overland flow.

Figure 3 below shows the proposed stormwater treatment train and effectiveness for the development as modelled in MUSIC.

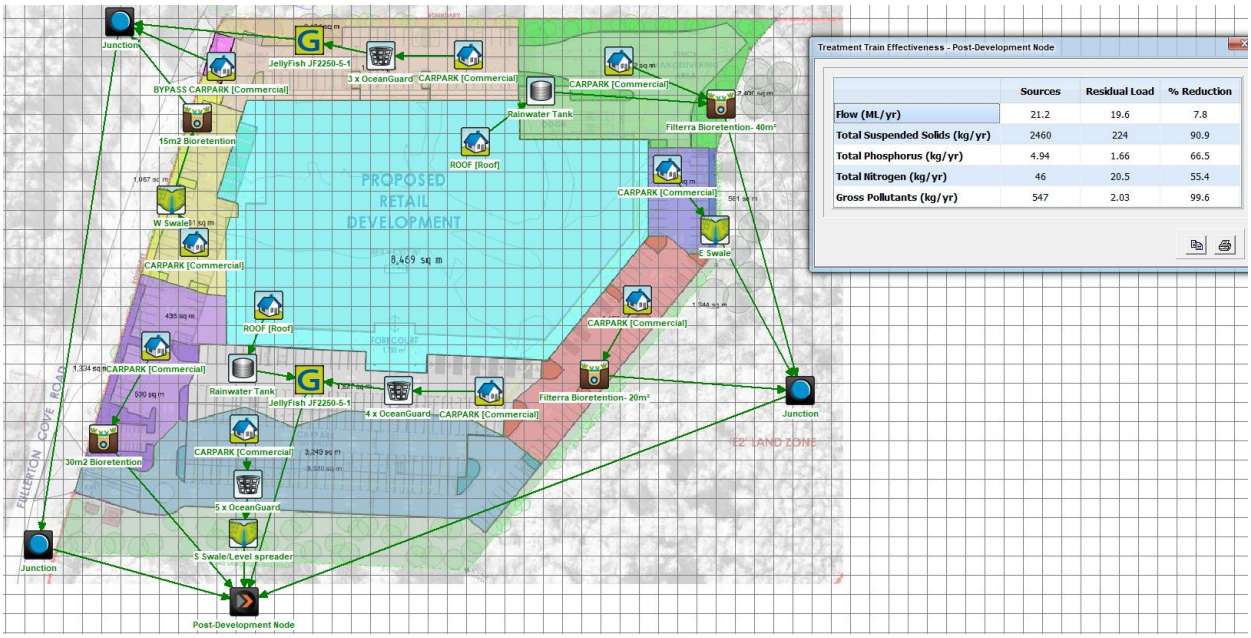


Figure 3 - MUSIC Treatment Train and Effectiveness

Table 2 summarises the results for the MUSIC model and compares the modelled reduction in pollutants to Council's stripping targets.

Table 2 - MUSIC Modelling Results

Pollutant	Sources (kg/ yr)	Residual Load (kg/ yr)	Reduction (%)	Council Stripping Target (%)
Total Suspended Solids (TSS)	2450	224	90.9	90
Total Phosphorus (TP)	5	1.67	66.7	60
Total Nitrogen (TN)	45.9	20.4	55.4	45
Gross Pollutants (GP)	547	2.03	99.6	90

Table 2 shows that the treatment train modelled in MUSIC is effective in meeting Council's stripping targets for reducing pollutants discharged from the development site in stormwater runoff. The MUSIC-Link report is provided in Appendix C. A copy of the MUSIC model can be provided upon request.

It will be the responsibility of the developer to manage and maintain all stormwater quality treatment devices.

Rainwater Reuse

In order to maximise the development's potential for reuse, each rainwater reuse tank has a proposed daily internal reuse parameter for toilet flushing and annual external irrigation demand applied.

To ensure that there is adequate draw down, the MUSIC model was used to assess the efficiency of the reuse tanks. The assumed water usage rate is outlined as follows.

- Irrigation usage

The total irrigation demand for the site has been determined using the MUSIC Modelling Guidelines for South East Queensland (2010). The guidelines state that for private gardens or low maintenance parklands an annual depth of 548mm over 75% of the pervious area is suitable for irrigation purposes.

Accordingly,

= 75% (irrigation ratio) x 548mm (low importance rate) x proposed irrigated area (m^2)

= 0.75m x 0.548m x 1,500m^2

= 620 kL/year (310kL/year per tank)

- Toilet flushing usage

For the preliminary analysis of the project, it was assumed that over the course of a 14-hour operational day, each of the 13 proposed restrooms in the retail development would be used on average every 15 minutes. This results in an estimated total average reuse demand for the retail development of 2.9kL/day (1.5kL/day per tank), assuming that two-thirds of all flushes are half flushes and that a half flush uses 3L while a full flush uses 6L.

The above reuse demands were split evenly between the two proposed tanks and the node water balance tool in MUSIC was used to ensure the general industry accepted minimum of 80% reuse efficiency was obtained. The results indicate that adequate draw down for the required reuse is attained for the proposed tank sizing and reuse scheme, with an 80.7% reuse efficiency achieved.

All downpipes are to be connected to a first flush device installed upstream of the tank inlet, to effectively remove sediment and attached pollutants. A one-way valve is to be installed at the outlet to prevent backflow entering the reuse tank.

2.4.2. Onsite Stormwater Detention – Stormwater Quantity

In accordance with previous discussions held with Council during the Pre-Lodgement meeting, the development proposes no dedicated onsite detention storage, on the basis that flood storage is provided onsite. We do not believe detention would be effective in this instance due to the proximity to receiving waters, elevated flood levels, and flood behaviour. The flood characteristics are generally flood storage, and unlikely to be affected by an increase in peak flow.

The flood modelling has not included detention and has assessed the impacts on this basis. Refer to *Results – Flood Impact* section of this report for further information.

It is noted that the 65kL of rainwater reuse storage and high reuse demands will further attenuate the quantity of flows from the site.

3. Flood Impact and Risk Assessment

3.1. General Requirements

This flood assessment has been prepared with the consideration of the following guidelines, reports and documents.

- Port Stephens Council Development Control Plan (PSC, 2023).
- Australian Rainfall and Runoff 2019 (AR&R 2019).
- NSW Floodplain Development Manual (NSW Government 2005).
- Williamtown/ Salt Ash Flood Study Review (BMT WBM, 2012).
- Williamtown - Salt Ash Floodplain Risk Management Study & Plan (BMT WBM, 2017).
- Flood Information Certificate for 42 Fullerton Cove Road, Fullerton Cove provided by Port Stephens Council and dated 30th of September 2020 (included as Appendix D).
- Flooding and Stormwater Management Study for Rezoning Proposal Submission at Lot 14 DP 258848 Fullerton Cove (Northrop, 2017).
- Architectural Drawings prepared by EJE Architecture.
- Civil Drawings and Design surfaces prepared by Northrop Consulting Engineers.

3.2. Methodology

The flood impact and risk assessment has been undertaken using the following procedure:

- Desktop review of all available information including design plans and latest survey data.
- Construction of an “Existing Case” one-dimensional DRAINS model using the latest procedures outlined in the 2019 Australian Rainfall and Runoff guidelines (AR&R 2019) to determine catchment runoff and estimate the critical storm duration for the 10%, 5%, 1% AEP, 1% AEP 2100 Climate Change horizon and PMF design storm events.
- Preparation of a “Existing Case” two-dimensional TUFLOW hydraulic model using the inflow hydrographs for the critical event derived by the one-dimensional DRAINS model.
- Preparation of a “Developed Case” two-dimensional TUFLOW model by modifying the existing case model to include the proposed development.
- A comparison of the results for the Existing and Developed Case scenarios to review the impact of the proposed development on the existing case flood behaviour.
- Review PSC DCP and assess the proposed development with respect to flood development controls of this document.

3.3. Study Area

The subject site is situated within the Fullerton Cove region which is expected to be subject to flooding through three mechanisms namely local catchment runoff, tidal inundation and flooding from the regional Fullerton Cove and Hunter River catchment.

The impact of fill on the existing flood behaviour within the subject site and general vicinity is expected to be greatest during the local catchment runoff and as such this mechanism is the focus of the flood impact portion of this assessment. Flood Planning Levels (FPL) for the subject site are based on the regional flood event which has been provided by Council in the Flood Information Certificate (ref: 83-2020-592-1).

The following Figure 4 presents the extent of the local catchment which has an approximate area of 228 hectares and terrain elevations ranging from approximately 0.1 metres AHD in the lower reaches to 26 metres AHD in upper reaches of the catchment. Land use throughout the local catchment is largely characterised as dense bushland, grassland and areas of residential subdivision.

3.4. Flood Model Setup

3.4.1. Hydrology

The hydrological model used in preparation of this study is the DRAINS one-dimensional software coupled with the Initial and Continuing Loss model. The combined hydrological and hydraulic computational capacity of DRAINS makes it ideal for this study as it enables storages to be included when reviewing the critical storm duration to be passed to the two-dimensional model.

Sub-Catchment Details

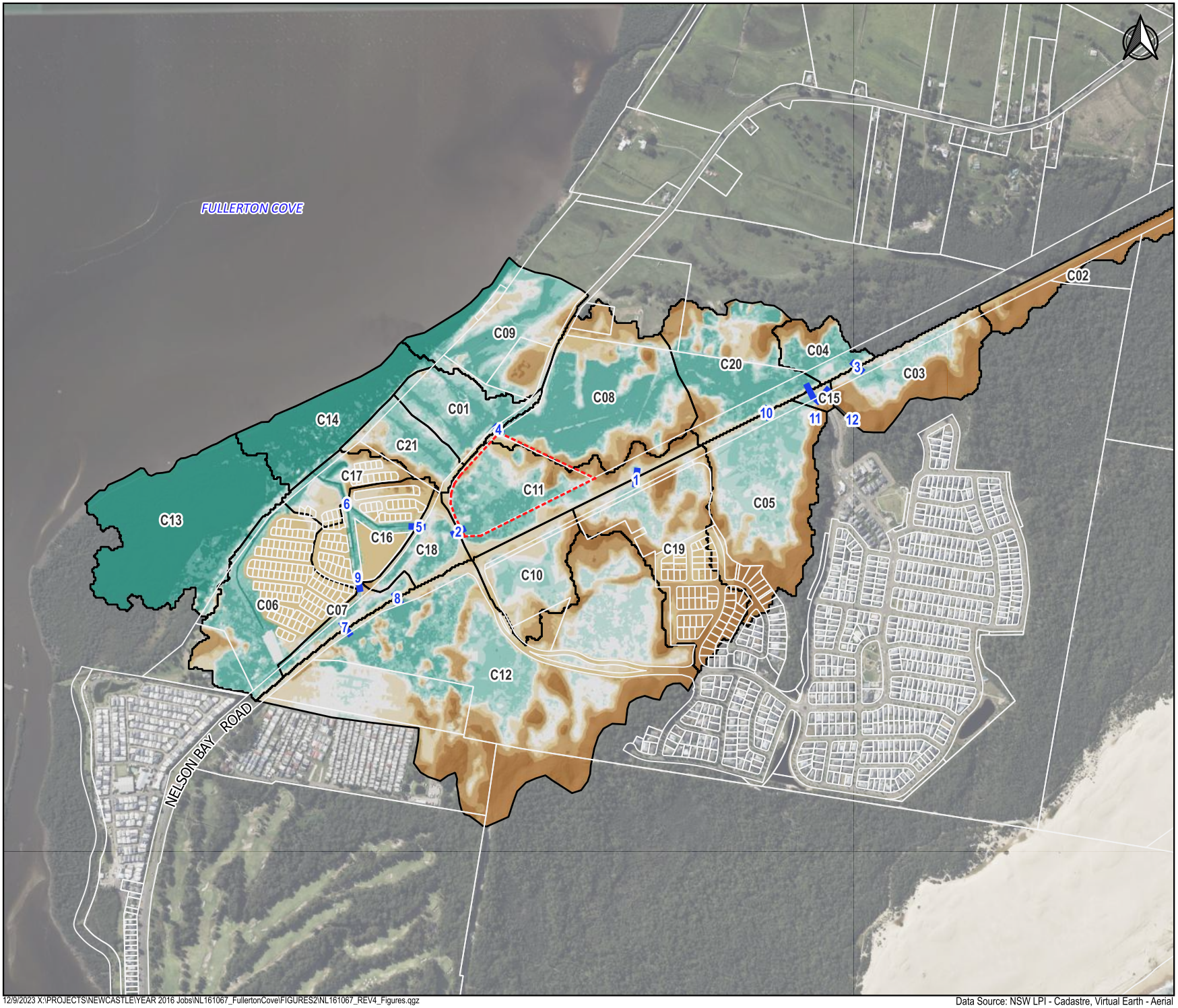
The latest Australian Rainfall and Runoff 2019 guidelines have been used for this study with a total of 21 sub-catchments delineated using a combination of LiDAR terrain data, cadastre aerial imagery and observations made during the site visit. The modelled sub-catchments are shown in Figure 4 with the catchment properties presented in the below Table 3.

Table 3 - Modelled sub-catchment properties

Catchment Reference	Area (ha)	Slope (%)	Catchment Reference	Area (ha)	Slope (%)
C01	5.76	2.4	**C12**	52.9	5.7
C02	4.29	17.8	**C13**	18.9	2.7
C03	8.21	10.6	**C14**	8.35	1.5
C04	3.36	4.9	**C15**	0.59	10.6
C05	16.1	10.6	**C16**	7.12	3.0
C06	14.6	1.8	**C17**	4.01	3.8
C07	2.42	3.8	**C18**	3.70	2.8
C08	17.1	3.9	**C19**	14.3	6.4
C09	11.8	2.5	**C20**	11.6	3.9
C10	6.99	3.3	**C21**	4.47	2.4
C11	11.3	3.9			

Burst Rainfall

The latest AR&R 2019 rainfall has been obtained from the BoM while the accompanying rainfall temporal patterns have been obtained by the AR&R Data Hub for a location over the study area. AR&R 2019 recommends the use of the storm ensemble method using 10 temporal patterns for each storm duration. For this investigation, storm durations ranging from the 6, 9, 12, 18, 24, 30, 36, 48, 72, 96, 120 and 144 hours events were assessed in the hydrological model to determine the critical storm event.



Legend

- Subject Site
- Cadastre
- Subcatchments
- Culverts

Terrain (mAHD)

- <= 0.9
- 0.9 - 1.4
- 1.4 - 1.6
- 1.6 - 1.8
- 1.8 - 2.2
- 2.2 - 2.8
- 2.8 - 3.3
- 3.3 - 5.5
- > 5.5

0 200 400 Metres

1:15,000

Figure 4

Hydrologic Model Subcatchments, Existing Landform and Hydrailuc Structures

42 Fullerton Cove Road
Fullerton Cove

NORTHROP

Data Source: NSW LPI - Cadastre, Virtual Earth - Aerial

The PMP design storm event rainfall depths and temporal patterns were estimated using the GSDM for durations up to 6 hours. The durations 15, 30, 45 minutes and 1, 1.5, 2, 2.5, 3, 4, 5, 6 hours were modelled to define PMF.

The 2100 Climate Change horizon have also been considered as part of this investigation. An increase in rainfall depths of 19.7% has been used which is based on the worst case RCP8.5 Interim Climate Change Factor provided by the AR&R 2019 Data Hub.

Pre-Burst Rainfall

The latest NSW Specific Transformational Pre-Burst depths has also been used as part of the investigation. These were obtained from the AR&R Data Hub for a location over the study area. As recommended by the latest AR&R 2019 guidelines, the 60min pre-burst depths have been used for storm durations less than 60 minutes.

Infiltration Losses

As mentioned previously, the Initial and Continuing Loss model has been used for this study with the latest AR&R 2019 storm losses were obtained from the AR&R Data Hub for a location over the study area. The Initial and Continuing Loss method simulates catchment storage as an initial loss in rainfall followed by a constant loss rate (continuing loss).

The below Table 4 presents the Initial and Continuing losses obtained from the AR&R Data Hub and the corresponding modelled loss rates. The latest OEH guidelines recommend reducing the continuing loss values provided by the AR&R Data Hub, by a factor 0.4 for un-calibrated models within NSW. As such, modelled continuing losses have been reduced accordingly.

Table 4 - Loss rates

Land Use	Initial Loss (mm)	Continuous Loss (mm/hr)
AR&R Data Hub Losses	13.0	2.80
Modelled Pervious Losses	13.0	1.12
Modelled Impervious Losses	1.5	0.00

3.4.2. Hydraulics

The hydraulic model used for this study is the two-dimensional TUFLOW hydrodynamic modelling software. The following provides a summary of the of the parameters and assumptions used in the development of the two-dimensional flood model. The TUFLOW model extent, boundary conditions, surface roughness and modelled 1D elements are shown on Figure 5 overleaf. TUFLOW version 2020-01-AA has been used for this study using the HPC GPU solver.

Digital Terrain Model

The DTM used for the two-dimensional model has been prepared as a combination of LiDAR elevation data, captured over the Fullerton Cove area in 2013, and the latest detailed survey of the subject site.

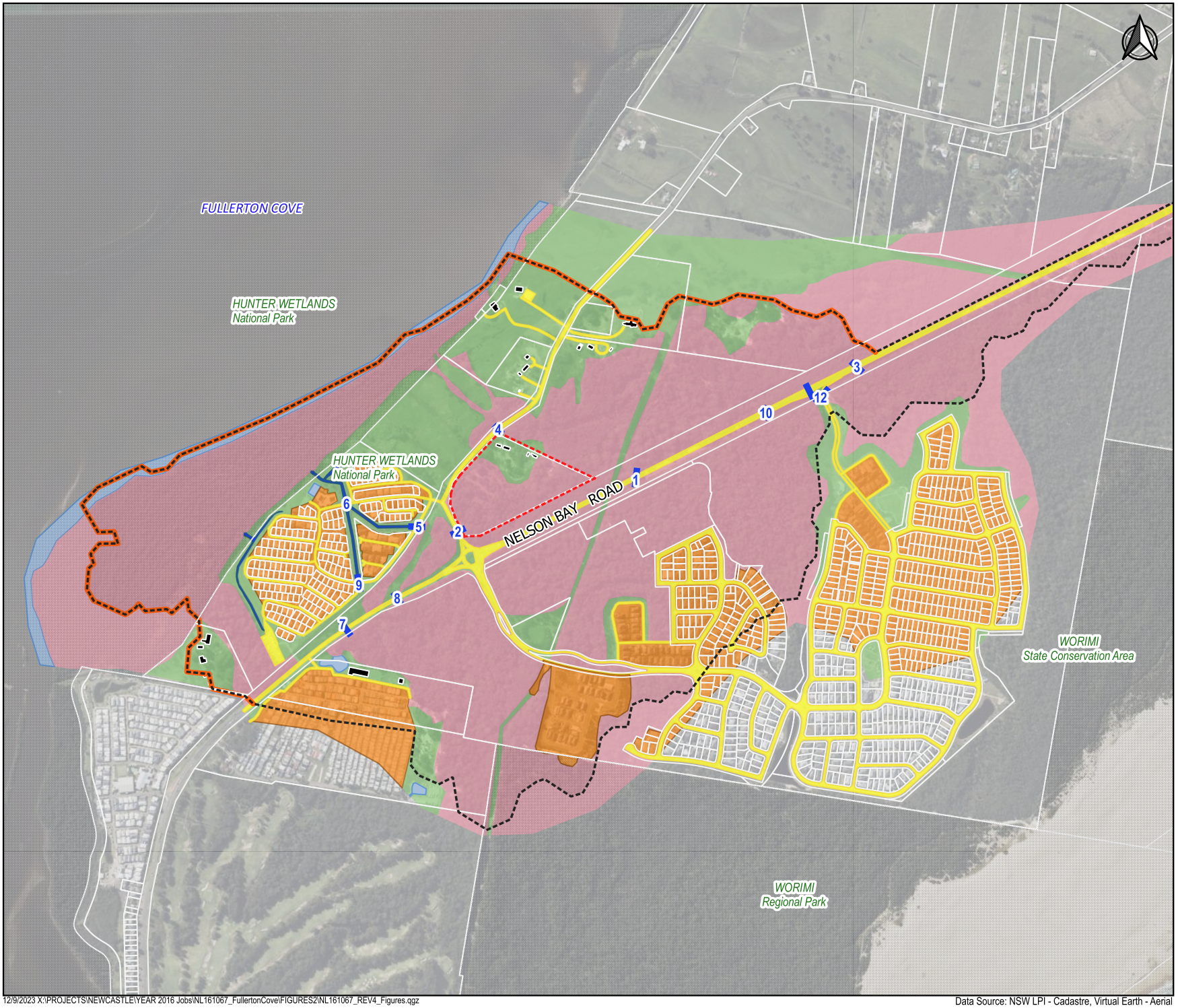
Some additional minor terrain modifications were also entered into the TUFLOW model manually to update the LiDAR elevation data to include observations made from the latest aerial imagery and during site visit.

The two-dimensional grid extent covers the full catchment extent presented in Figure 4. A three metre grid size has been adopted which was considered an appropriate balance between the representation of flows through open channels and model run-time.

Adopted Boundary Conditions

Critical storm inflow hydrographs for the 10%, 5%, 1% AEP and PMF design storm events, generated by the one-dimensional DRAINS model were entered into the two-dimensional model at sub-catchment storage zones and outlet locations.

Outflow tailwater conditions were based on information contained in the *Williamtown Salt Ash Flood Study (WBM, 2005)* with a dynamic outlet head boundary, simulating the 50% AEP tide with a maximum elevation of 1.17m AHD, entered into the model at the location shown in Figure 5 overleaf. These conditions represent a “Free Outfall” tailwater condition which have been adopted as a worst-case scenario for flood impact comparison purposes.



Legend

- Subject Site
- Cadastre
- TUFLOW Model Extent
- Downstream Boundary
- Culverts

Landuse - Manning's n

- Grassland (0.045)
- Sealed Roads (0.020)
- Bushland (0.070)
- Open Water (0.020)
- Channels (0.040)
- Residential (0.090)
- Buildings (0.100)

0 200 400 Metres

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Figure 5

2D TUFLOW Model Setup

42 Fullerton Cove Road
Fullerton Cove

NORTHROP

12/9/2023 X:\PROJECTS\NEWCASTLE\YEAR 2016 Jobs\NL161067_FullertonCove\FIGURES2\NL161067_REV4_Figures.qgz

Data Source: NSW LPI - Cadastre, Virtual Earth - Aerial

Hydraulic Structures

The location of the modelled below ground stormwater infrastructure entered the two-dimensional TUFLOW model is presented in Figure 5. The type, size and assumed blockage factors are summarised in in the below Table 5. Blockage is based on observations made during site inspection.

Table 5 - Modelled Hydraulic Structures (Culverts)

Culvert Reference	Culvert Type	Culvert Size	Blockage Factor
1	Pipe	450 mm	0%
2	Pipe	450 mm	50%
3	Pipe	600 mm	0%
4	Pipe	225 mm	90%
5	Pipe	600 mm	0%
6	Pipe	3 x 900 mm	0%
7	Pipe	600 mm	0%
8	Pipe	450 mm	0%
9	Pipe	3 x 900 mm	0%
10	Box	1200 mm x 600 mm	0%
11	Pipe	450 mm	0%
12	Pipe	375 mm	0%

3.5. Results

3.5.1. Critical Duration

To determine the critical storm duration for the 10%, 5% and 1% AEP design storm events, the guidance provided in the latest AR&R 2019 guidelines was considered as summarised below:

- Classification of the median value of the ten temporal patterns for each storm duration; and
- Selection of the duration that produces the maximum median value for each return interval.

For the 10%, 5% and 1% AEP design storm events, the one-dimensional DRAINS model was used to determine the critical storm durations which were then passed into the two-dimensional TUFLOW model. The one-dimensional DRAINS model incorporates hydrodynamic linkages (channels, culverts, overflow routes and storage basins) between sub-catchment nodes to ensure the catchment storage within the catchment is accounted for when determining the local catchment critical storm duration.

All durations ranging from the 15-minute to the 6-hour were run in the TUFLOW model to determine the critical event for the PMF design storm event. The below Table 6 presents the resultant critical storm durations for each return interval across the subject site.

Table 6 - Critical storm durations

Return Interval	Duration	Temporal Pattern
10% AEP	48-Hour	TP3
5% AEP	72-Hour	TP1
1% AEP	72-Hour	TP8
PMF	30-Minute	-

The results presented herein for the PMF are an envelope of all durations analysed however, the duration nominated in the above Table 6 was observed to produce the highest water level across the majority of the catchment and the subject site.

3.5.2. Existing Flood Behaviour

The existing case maximum flood depth, elevations, velocity and hazard across the subject site and the vicinity, for the 10%, 5%, 1%, 1% AEP Climate Change and PMF flood events are presented in **Figures B1** to **B5-2** of **Appendix E**.

Flood hazard is based on the latest AR&R 2019 and Australian Institute of Disaster Resilience (AIDR) hazard categories presented in Figure 6 below.

Due to the low lying and flat nature of the local catchment, flows derived by the upstream catchment are expected to pond across the subject site and in the upper reaches of the catchment before continuing downstream. Flows derived from the upstream catchment, pass across Nelson Bay Road before continuing in a north-westerly direction through the subject site and across Fullerton Cove Road located adjacent to the western boundary of the subject site. Downstream of the subject site, flows continue in a north-westerly direction, through an open channel located in the Cove Village before continuing in a northerly direction and discharging into Fullerton Cove.

During local catchment flood conditions, the results presented in **Figures B2** and **B3** demonstrate flood water is expected to begin overtopping Fullerton Cove Road and Nelson Bay Road during the 5% AEP flood event. Flood depths during the 1% AEP remain relatively shallow with **Figure B3** showing depths less than 250mm are expected across these roads. **Figure B3-2** suggests the 1% AEP flood hazard of H1 (safe for pedestrians and vehicles) is expected across Fullerton Cove Road.

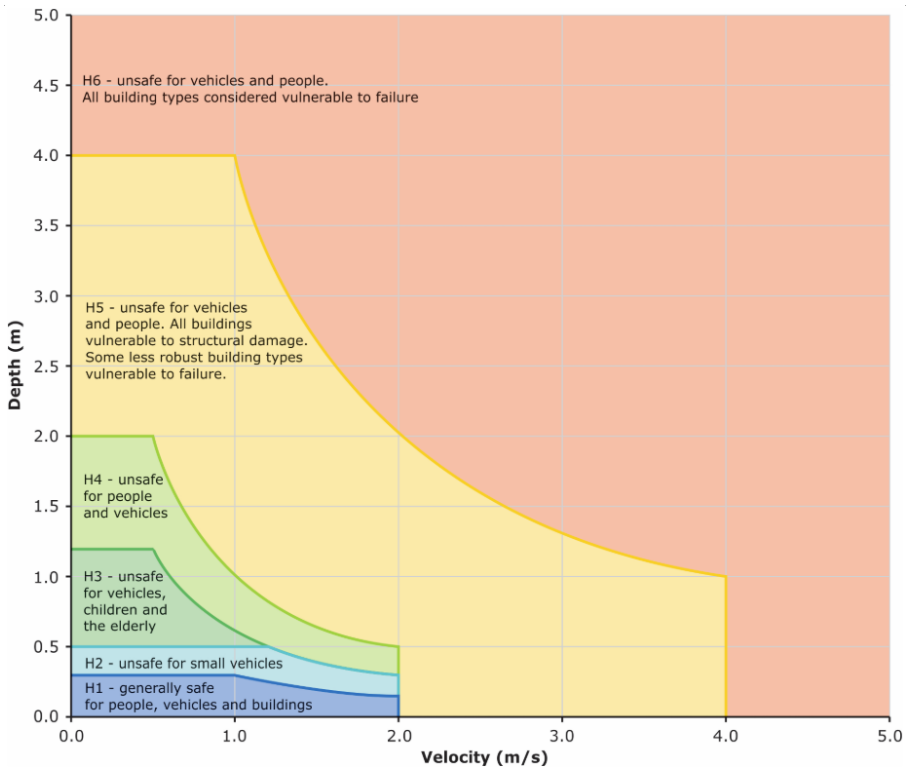

Figure 6 - Australian Rainfall and Runoff (2019) Hazard Categories

The following Table 7 summarises the modelled maximum water depth and elevations across the subject site during existing conditions for the 10%, 5%, 1%, 1% AEP Climate Change and PMF events.

Table 7 - Subject Site Existing Case Flood Depth and Elevation

Flood Event	Max Water Level (m AHD)	Max Water Depth (m)	Max Velocity (m/s)	Max Hazard (AR&R 2019)
10% AEP	1.84	0.94	0.11	H3
5% AEP	2.03	1.12	0.11	H3
1% AEP	2.11	1.20	0.14	H3
1% AEP Climate Change 2100	2.17	1.26	0.16	H3
PMF	2.83	1.92	0.39	H4

3.5.3. Developed Case

The modelled maximum flood depth, elevations, velocity, and hazard for the developed case scenario during the 10%, 5%, 1%, 1% AEP Climate Change and PMF flood events are presented in **Figures C1** to **C5-2** of **Appendix F**.

Flow conditions during the developed case remain largely unchanged when compared with the existing case. A summary of the modelled maximum flood elevation, depth, velocity, and hazard flow conditions across the subject site are summarised in the below Table 8.

Table 8 - Subject Site Developed Case Flood Behaviour

Flood Event	Max Water Level (m AHD)	Max Water Depth (m)	Max Velocity (m/s)	Max Hazard (AR&R 2019)
10% AEP	1.85	0.95	0.12	H3
5% AEP	2.04	1.13	0.11	H3
1% AEP	2.12	1.21	0.14	H3
1% AEP Climate Change 2100	2.17	1.26	0.16	H3
PMF	2.84	1.93	0.39	H4

A comparison of the available flood storage volumes within the subject site during the 10%, 5% and 1% AEP for both the existing and developed case scenarios is shown in Table 9 below.

Table 9 - Comparison of Available Flood Storage on the Site

Flood Event	Existing (m^3)	Developed (m^3)	Difference (m^3)	Difference (%)
10% AEP	15,757	15,178	-579	-4
5% AEP	24,452	22,289	-2,163	-9
1% AEP	28,680	25,564	-3,116	-11
1% AEP Climate Change 2100	31,489	27,636	-3,853	-12

The comparison presented in Table 9 above shows a decrease of up to 11% in available flood storage across the subject site during major flood event and a decrease of up to 4% during minor events. The reduction in flood storage does not have a significant adverse impact on the existing flood behaviour as discussed below.

3.5.4. Flood Impact

The impact of the proposed development on the existing flood conditions on the subject site and within adjacent properties during the 10%, 5%, 1%, 1% AEP Climate Change and PMF flood events is shown in the attached **Figures D1** to **D5** of **Appendix G**.

During the 10% AEP, **Figure D1** shows an insignificant increase in flood elevation up to approximately 12mm across the subject site and downstream.

During the 5% AEP, **Figure D2** shows an insignificant increase in flood elevation of approximately 13mm across the subject site and downstream. A localised increase approximately up to 78mm is observed immediately upstream of the Cove Drive culvert. This increase is a minor in extent and will not result a change of the exiting flood hazard conditions and is therefore not expected create a significant adverse impact.

Only minor changes are observed during the 1% and 1% AEP Climate Change flood events with **Figures D3 and D4** showing an increase in the order of 11mm and 6mm across the subject site and downstream areas during the 1% AEP and 1% AEP Climate Change events, respectively.

The **Figure D5** presents the impact of the proposed development on the existing flood behaviour during the PMF flood event. The results demonstrate an increase generally less than 7mm in adjacent properties but up to 10mm through the overland flow path in The Cove Village downstream. A commensurate decrease is also observed to the north of the subject site with these changes in flood levels are expected to be due to the removal of a minor flow path across the proposed fill pad located in the north-eastern corner of the subject site. Given the magnitude of the event and the magnitude of the increase, these impacts are not expected to create a significant adverse impact on the subject site or within the adjacent properties.

The time of inundation across major road crossings and within catchment storage zones is not expected change significantly due to the introduction of the proposed development.

3.6. Discussion

3.6.1. Finished Floor Level

Habitable finished floor level of 2.90m AHD proposed across the proposed retail/commercial facility and meets minimum FFL requirements specified in the Council's Flood Information Certificate for habitable rooms.

Proposed driveway access to the development is located above the current day 1% AEP flood level of 2.12m AHD. Similarly, the majority of the open carparks are above this level. Some of the southern portion of the carpark is inundated in this event to maintain as much flood storage as possible, and is subject to H1 hazard category.

3.6.2. Council Requirements and Assessment

The proposed development is categorised as commercial development (Fill / All other developments) and, as identified in the Council's Flood Information Certificate, and is located in the following flood hazard areas:

- High Hazard Flood Storage,
- Low Hazard Flood Storage, and
- Low Hazard Flood Fringe.

The below **Table 8** provides commentary responding to the flooding related development controls outlined in Chapter B5 of Port Stephens Council Development Control Plan 2023.

Table 8 – Development Controls (PSC DCP, 2023)

Item	Item Reference	Response
Site selection		
B5.1	If multiple flood hazard categories are specified for a site on a flood certificate, the proposed development must be located on the land with the lowest flood risk.	The majority of development area is located in Low Hazard Flood Storage and Low Hazard Flood Fringe zones.
Finished floor level (FFL)		
B5.2	Development must meet the minimum **FFL** as specified in Figure BJ. Note: The National Construction Code may provide minimum **FFL**s for some categories of development which prevail to the extent of any inconsistency with these controls. The finished surface of open space car parking, carports and driveways should be designed having regard to vehicle stability, including consideration of depths and velocity during inundation by flood waters.	Refer to the *Finished Floor Level* paragraph in this section of the report. The finished floor level of the building is set at the flood planning level of 2.9m AHD. The carpark and driveway access is generally compliant, with the majority above the current day 1% AEP event.

Item	Item Reference	Response
Flood compatible design		
B5.3	Development for a building (and/or an associated driveway or access) must be of a **flood compatible design** and construction and shall meet the relevant requirements in the Construction of Buildings in Flood Hazard Areas (Australian Building Codes Board). Council may also require **structural certification** for development proposed on land which becomes a floodway in the **PMF**.	We recommend that flood compatible materials are adopted below the Flood Planning Level. We expect this will be considered at the Construction Certificate phase. We do not believe structural certification in the PMF will be required.
Fencing		
B5.4	Fencing on **flood prone land** should be stable in events up to the current day **1% AEP flood event** and not obstruct the flow of floodwater.	Proposed fences located within flooded areas will be designed to be of open style in accordance with this requirement, so as to not impede the flow of flood water.
Electrical features		
B5.5	All incoming main power service equipment, including all metering equipment, and all electrical fixtures, such as power points, light fittings, switches, heating, ventilation and other service facilities must be located above the **FPL**, or where possible above the **PMF**. Where the above cannot be achieved, the following features shall be used: • Electrical cabling is not to be installed within walls, or chased into walls; and • Any circuit containing switches, power points or any other electrical fitting that are located below the **FPL**, shall connect to the power supply through an individual Residual Current Device (**RCD**), located in the meter box.	This is not expected to be limiting in design and will be considered during to Construction Certificate Phase.
Potentially hazardous and/or polluting		
B5.6	The storage of hazardous or potentially hazardous materials, potentially polluting material or material that could be washed from site and cause harm downstream must be stored above the **FPL** with appropriate bunding.	Hazardous or potentially polluting materials are to be stored above the Flood Planning Level.

Item	Item Reference	Response
B5.7	Items that may wash away during flood events (e.g. rainwater tanks, hot water tanks, gas cylinders, shipping containers) must be elevated above the **1% AEP flood event** level in the year 2100 (without **freeboard**) or anchored to resist buoyancy and impact forces	These items are to be elevated and anchored above the 1% AEP 2100 flood event level.
Flood impact and risk assessment		

B5.8	A **flood impact and risk assessment** is required for:
	• Any **fill** on land identified as **floodway**.
	• Any **fill** located in a **flood storage area**, unless:
	  ○ The net volume of **fill** does not exceed the lesser of 20% or 2000m^3 of the **flood volume** of the lot in the 1% AEP flood event in the year 2100 (this includes consideration of previous **fill** volumes); and
	  ○ It is demonstrated that the **fill** does not adversely affect local drainage patterns of all events up to the 1% AEP flood event in the year 2100.
	Note: Fill in **flood storage areas** greater than the abovementioned volume can be offset by **flood storage**. Offsetting can be achieved through consolidation of lots and/or assigning an 'easement to flood land' on the compensatory lot/s. Compensatory lots must be located within the zone of influence of the proposed **fill** (as demonstrated by the **flood impact and risk assessment**) or adjacent to the proposed **fill** and be of the same hazard category of the subject site.
	• Any **fill** for the purposes of a **livestock flood refuge mound**, unless the **livestock flood refuge mound** is located in an identified **flood fringe** area:
		The impact of the proposed filling has been reviewed as part of this flood impact and risk assessment. It is concluded that the proposed development is not expected to create a significant adverse impact on local drainage pattern and adjacent properties. Refer to the *Flood Impact* section of this report

Item	Item Reference	Response
	○ The volume/size and location of the livestock flood refuge mound meets the criteria in Figure BK; and ○ The size of the mound must have regard to the agricultural capacity of the land. The design and size of the mound shall be determined by reference to the *NSW Department of Primary Industries –Agriculture. 2009, 'Primefacts: Livestock flood refuge mounds*'; and • Where the proposed development could change flood behaviour, affect existing flood risk, or expose people to flood risks that require management or; • If Council determines a **flood impact and risk assessment** is necessary for any other reason.	
Ongoing flood adaptation		
B5.9	For residential accommodation, subdivision, commercial premises, industrial premises, garages, open car parking spaces and carports, a reduced planning horizon of 50 years from the date of determination will be accepted where the design facilitates ongoing flood adaptation (ie the future raising of the building).	Not applicable.
Minor alterations and additions to existing residential accommodation		
B5.10	Where proposed alterations and additions to existing **residential accommodation** is less than 40% of the **gross floor area** of the existing **residential accommodation** and does not involve a net increase in the number of bedrooms, Council will consider a **FFL** lower than the **flood planning level (FPL)**, but not lower than the existing floor level. Any additional flood risk must include mitigation measures to reduce the overall flood risk of the development.	Not applicable.

Item	Item Reference	Response
Driveways and access		
B5.11	Access from the building envelope to the public road is to have a minimum **finished access level** of: • The **flood immunity** of the connecting public road; or • The current day **1% AEP flood event** level for the site.	This item is compliant. See above *Finished Floor Level* paragraph in this section of the report.
B5.12	Earthworks for driveways and access must satisfy the objectives of B3.C of the **DCP** and **LEP**. Note: Impacts on local drainage and localised flooding should be considered and addressed. Driveways should be designed and constructed in accordance with Councils standard design drawings.	Refer to Civil Drawings provided in *Appendix A.*
Subdivision		
B5.13	Subdivision that creates the ability to erect additional dwellings is to indicate building envelopes above the **FPL** and comply with the requirements of B5.11, B5.12 and B5.14 of this Part.	N/A
Emergency onsite flood refuge		
B5.14	If evacuation egress from residential accommodation, a commercial premises, an industrial premises, fill or development vulnerable to emergency response and critical infrastructure to flood free areas cannot be achieved via a route that is flood free in the current day **1% AEP flood event** or is a **low hazard flood area**, an onsite **flood refuge** must be provided meeting the following criteria: • Is located above the **PMF** level; • Is intrinsically accessible to all people on the site, plainly evident and self-directing; • Is accessible in sufficient time for all occupants with fail safe access and no reliance on elevators; • Has unobstructed external access for emergency boats during flooding; • Caters for the number of persons that could reasonably be	The proposed evacuation route is to the south via Fullerton Cove Road and Seaside Boulevarde to a higher ground in Fern Bay Seaside Village. Fullerton Cove Road and Seaside Boulevarde are flood free or have low flood hazard during the 1% AEP flood event (refer to flood hazard figures of this report). We note the finished floor level is flood free in the local catchment PMF, and the 1% AEP plus 500mm 50 years from now. The only event where the building is inundated is the regional PMF where there is expected to be 18 hours warning time for trigger levels in excess of 3.5m. (http://www.bom.gov.au/nsw/NSW_SLS_Current.pdf)

Item	Item Reference	Response
	expected on-site at any one time (approx. 2m² per person); • Provides adequate shelter from the storm and has natural lighting and ventilation; and • Contains sufficient clean water, a first aid kit, portable radio with spare batteries and a torch with spare batteries. Note: If a **flood refuge** is required, the DA must be accompanied by **structural certification**.	
Development on land identified as overland flow path		
B5.15	A site based overland flow report must be submitted for development located within a designated overland flow path. The purpose of this report is to demonstrate that the development: • Will not result in material increase in flood level or flood hazard upstream, downstream or surrounding properties; and • Will provide acceptable management of flood risk with appropriate development levels to ensure the safety of people.	Development is not located on land identified as overland flow path.

3.6.3. Drainage Under Fullerton Cove Road

Consideration was given to upgrading the drainage under Fullerton Cove Road from a 450mm diameter RCP to 2 x 2.4m wide x 0.6m high RCBC. This had no significant change in water level (+/- 10mm) due to the lack of hydraulic grade with downstream of Fullerton Cove Road, and the limiting infrastructure within the downstream neighbouring lot.

We do not expect upgrading this downstream infrastructure would be feasible without owners' consent, and we do not believe this would be forthcoming due to the likely increases in flood level within this neighbouring lot.

4. Conclusion

The proposed Stormwater Management Strategy is considered to effectively meet the objectives of the PSC's DCP.

It was concluded that the proposed development will not create any significant adverse impacts to flood behaviour on the subject site and on the properties surrounding the subject site.

Furthermore, flood risk in the developed case has been adequately managed through the selection of floor levels, driveway access levels, and flood compensatory cut.

We trust this meets with Council's requirements however should you have any queries, please feel free to contact the undersigned on (02) 4943 1777.

Yours faithfully,

Stormwater Management

Emma Gearing

Civil Engineer

BEng (Civil)

Flood Management

Angus Brien

Principal | Flood Engineer

BEng (Civil) (Hons) MIEAust CPEng NER RPEQ Member SIA FMA

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Document Register

Rev	Status	Prepared	Approved	Date
A	Approval	RB/EG	GB/KS	13 September 2023

Appendix J – BDAR Checklist

Stage 1 Checklist

BAM Reference	Information	BDAR Section	Completed
Report			
Introduction - Chapters 2 and 3	Introduction to the biodiversity assessment including: ● brief description of the proposal ● 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 BCAR) ● general description of the subject land ● sources of information used in the assessment, including reports and spatial data	1.1 Introduction 1.1.2 Assessment Scope 1.1.3 The Proposal 1.1.5 Site Particulars 1.1.7 Information Sources Figure 1 Site Map Figure 2 Location Map Appendix A Development Plan Appendix H Important areas map	Yes
Landscape - Section 3.1, 3.2 and Appendix E	Identification of site context components and landscape features, including; General description of subject land topographic and hydrological setting, geology and soils	1.2 Landscape Features Figure 2 – Location Map	Yes
	Percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2).	1.3.2 Landscape Native Vegetation Cover	Yes
	IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	1.2.1 Regional Landscapes	Yes
	Identified Landscape Features classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	Identified Landscape Features within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	1.2.2 Identified Landscape Features Appendix G Other Legislation Table 2 Landscape Feature Assessment	Yes
	Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	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.)	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	Areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(8-9.))	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	Any additional landscape features identified in any SEARs for the proposal	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	NSW (Mitchell) landscape on which the subject land occurs	1.2.1 Regional Landscapes	Yes

BAM Reference	Information	BDAR Section	Completed
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)	1.4 Native Vegetation Figure 3 Regional Vegetation Mapping Appendix F Site Photographs	Yes
	Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	1.4 Native Vegetation 1.4.3 PCT Selection Justification Appendix F Site Photographs	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)	1.4.1 Regional Mapping 1.5 Threatened Species Appendix B Flora Species List	Yes
	Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	1.4.1 Regional Mapping 1.4.2 Plot Based Floristic Surveys 1.4.3 PCT Selection Justification Figure 7 - Flora Survey Effort 1.4.7 Vegetation Integrity Score 1.5.3 Field Survey Methods Appendix D BAM Field Sheets Appendix F Site Photographs	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	Yes
	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.))	1.4 Native Vegetation 1.4.4 PCT Selection Justification Figure 3 Regional Vegetation Mapping Tables 4-9 – Species Data for Potential PCT Determination Tables 4 9 PCT Determination Appendix G – Other Legislation	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)	1.4 Native Vegetation 1.4.1 Regional Mapping 1.4.2 Plot Based Floristic Surveys 1.4.3 PCT Selection Justification	Yes

BAM Reference	Information	BDAR Section	Completed
	• 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.))	1.4.6 Vegetation Integrity Assessment 1.4.7 Vegetation Integrity Score Table 9 Summary of Vegetation Zones Areas Table 10 Vegetation Integrity Score Table 1.5.3 Field Survey Methods Figure 3 Regional Vegetation Mapping Figure 4 Ground-Truthed Vegetation Map Figure 7 & 8 Survey Effort Maps	
	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	
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	1.5 Threatened Species 1.5.3 Field Survey Methods 1.5.1 Ecosystem Credit Species 1.5.2 Species Credit Species 1.6.2 Species Credit Species Survey Results Table 11 Predicted Ecosystem Credit Species Table 12 Potential Species Credit and SAII Species Appendix E Biodiversity Credit Report	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)	1.5.3 Field Survey Methods 1.5.1 Ecosystem Credit Species 1.5.2 Species Credit Species Table 11 Predicted Ecosystem Credit Species Table 12 Potential Species Credit and SAII Species 1.6.2 Survey Effort Results Table 17 Species Credit Species	Yes

BAM Reference	Information	BDAR Section	Completed
	• 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	Appendix C Fauna Species List	
	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.))	Table 4-9 PCT Determination Tables 1.5.3 Field Survey Methods 1.6.1 Survey Effort Results Table 11 Predicted Ecosystem Credit Species EPBC Act Assessment recorded within the Subject Site – Appendix G Other Legislation Table 17 Species Credit Species Koalas – Appendix G Other Legislation	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)	Table 17 Species Credit Species Figures 7 & 8 Survey Effort Appendix B Flora Species List Appendix C Fauna Species List Appendix E Biodiversity Credit Report Appendix F Site Photographs	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	1.5.3 Field Survey Methods 1.6.1 Survey Effort Results Table 17 Species Credit Species Figure 7 & 8 Survey Effort Appendix D BAM Field Sheets Appendix K CVs	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	N/A	N/A

BAM Reference	Information	BDAR Section	Completed
	● all requirements of Box 3 have been addressed in the expert report		
	Where use of local data is proposed (BAM Subsection 1.4.2): ● 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	N/A	N/A
	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)	Figures 9, 10 & 11	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)	1.2.2 Identified Landscape Features 2.2 Impact Avoidance Measures	Yes

BAM Reference	Information	BDAR Section	Completed
	• 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) • 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 Species Credit Species	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)	1.5.3 Field survey methods 1.6.1.1 Habitat trees Table 16 Habitat Tree Detail Table 17 Species Credit Species	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	
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 Site Map Figure 2 Location Map	Yes

BAM Reference	Information	BDAR Section	Completed
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 Site Map Figure 2 Location Map	Yes
	Location Map ● Digital aerial photography at 1:1,000 scale or finer ● Boundary of subject land ● Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ● Landscape features identified in BAM Subsection 3.1.3 ● Additional detail (e.g. local government area boundaries) relevant at this scale	Figure 1 Site Map Figure 2 Location Map	Yes
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or r Location map include: ● IBRA bioregions and subregions ● rivers, streams and estuaries ● Identified Landscape Features and important Identified Landscape Features ● 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 Site Map Figure 2 Location Map	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 1 Site Map Figure 2 Location Map Figure 3 Regional Vegetation Mapping Figure 4 Ground-Truthed Vegetation Map	Yes
	Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4 Ground-Truthed Vegetation Map	Yes
	Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	Figure 4 Ground-Truthed Vegetation Map	Yes
	Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	Figure 4 Ground-Truthed Vegetation Map	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 Location Map Figure 4 Ground-Truthed Vegetation Map Table 4-9 PCT Determination Tables	Yes

BAM Reference	Information	BDAR Section	Completed
		Table 9 Summary of Vegetation Zones Areas	
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 9 Summary of Vegetation Zones Areas Table 16 Habitat Tree Detail Table 10 Vegetation Integrity Score Table	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 11 Predicted Ecosystem Credit Species Table 13 Potential Species Credit and SAII Species Table 17 Species Credit Species Table 27 Ecosystem Credit Requirements	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 17 Species Credit Species Table 28 Species Credit Species	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 11 Predicted Ecosystem Credit Species Table 27 Ecosystem Credit Requirements Table 28 Species Credit Species Table 12 Potential Species Credit and SAII Species Table 17 Species Credit Species	Yes
Prescribed impacts Chapter 6			

BAM Reference	Information	BDAR Section	Completed
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

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	2.2 Impact Avoidance Measures 1.6.1.1 Habitat trees Table 17 Species Credit Species	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)	2.2.1 Project Design 2.2 Impact Avoidance Measures Appendix G – Other Legislation	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.))	2.2.1 Project Design 2.2 Impact Avoidance Measures	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)	Table 20 Prescribed Impact Avoidance and Minimisation 2.2 Impact Avoidance Measures Appendix G – Other Legislation	Yes

BAM Reference	Information	BDAR Section	Completed
	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	2.2 Impact Avoidance Measures	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	1.2.2 Identified Landscape Features 2.1 Avoid and Minimise Summary Table 12 Potential Species Credit and SAII Species	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	2.2 Impact Avoidance Measures 2.2.1 Project Design 2.2.6 General Construction & Operation Table 20 Prescribed Impact Avoidance and Minimisation Table 21 Direct Impact Assessment	Yes

BAM Reference	Information	BDAR Section	Completed
	• evaluate the risk and consequence of any residual impacts • document any adaptive management strategy proposed	Table 22 Prescribed Impact Assessment Table 23 Indirect Impact Assessment Table 24 Residual Impact Assessment	
	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)	2.2 Impact Avoidance Measures Tables 21-24	Yes
	Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	2.2 Impact Avoidance Measures Table 20 Prescribed Impact Avoidance and Minimisation Tables 21-24	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 • 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	2.1 Avoid and Minimise Summary Table 19 Avoid and Minimise Impacts on Biodiversity Values Table 12 Potential Species Credit and SAII Species	Yes
	Identification of impacts requiring offset in accordance with BAM Section 9.2	2.5 Biodiversity Credit Report	Yes
	Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	2.4.4 Vegetation Clearance Not Requiring Offsetting	Yes
	Identification of areas not requiring assessment in accordance with BAM Section 9.3	2.4.4 Vegetation Clearance Not Requiring Offsetting	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)	2.4 Summary of Potential Impacts on Biodiversity Appendix E Biodiversity Credit Report	Yes

BAM Reference	Information	BDAR Section	Completed
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	N/A	
	Maps demonstrating indirect impact zones where applicable	Appendix A Development Plan	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Maps showing areas of direct and indirect impact.	Figure 6 – Impacts and Retention Area	Yes
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	No Maps	N/A	

BAM Reference	Information	BDAR Section	Completed
Impact Summary – Chapter 9	Map showing the extent of TECs at risk of an SAII within the subject land	N/A	
	Map showing location of threatened species at risk of an SAII within the subject land	N/A	
	Map showing location of: ● impacts requiring offset ● impacts not requiring offset ● areas not requiring assessment	Figures 4, 6, 10, 11 & 12	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 showing areas of retention and proposed Stewardship Site.	N/A	Yes
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 20-25	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 10 Vegetation Integrity Score Table	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 20-25	Yes
Impact Summary - Chapter 9	No Tables		
Impact Summary - Chapter 10	Table of PCTs requiring offset and the number of ecosystem credits required	Table 27 Ecosystem Credit Requirements	Yes
	Table of threatened species requiring offset and the number of species credits required	Table 28 Species Credit Requirements	Yes

BAM Reference	Information	BDAR Section	Completed
Biodiversity credit report – Chapter 10	Table of credit class and matching credit profile	Appendix E	Yes
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

BAM Reference	Information	BDAR Section	Completed
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	N/A
	Maps in jpeg format	N/A	N/A

Appendix K – CVs

ALISSA ROGERS

Curriculum Vitae

Alissa works with AEP in the role of Ecologist. She completed a Bachelor of Park Management and holds a Certificate III Conservation and Land Management. She has extensive experience in bush regeneration, including planning, leading field staff, mapping and report writing. Her background in project management and park management combined with her ecological knowledge is utilized in a diverse array of applications in her current role.

Qualifications

- Bachelor of Park Management, Deakin University, Burwood, Victoria.
  Natural resource management plus business management, wildlife ecology, fire ecology, extension marketing, community engagement and communications.
- Certificate III Conservation and Land Management Tafe NSW Newcastle Campus

Further Education & Training

- Operate and Maintain a Tractor, Tocal Collage, Tocal NSW
- Geographic Information Systems ArcGIS, MapInfo, QGIS various providers
- NSW Boar Driver's License
- ChemCert Australia
- NSW Driver's License: Car (Class "C")
- First Aid Certificate
- White Card

Fields of Competence

- Field assessment including: targeted fauna and flora surveys, BAM plots, Koala Spot Assessment Technique (SAT) surveys, tree surveys
- Assessment of sites, production of due diligence Biodiversity Development Assessment reports (BDAR), Ecological Assessment Reports (EAR)
- Production of assessments against Various legal instruments such as;
- EPBC Act fauna and flora assessments
- Comprehensive Koala plans of management and WSEPP 44 and SEPP Koala Habitat Protection assessments
- Bushfire threat analysis and reporting
- Competence 9n GIS Mapping software

Relevant Employment History

February 2020 - 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, bushfire, planning services, advices, strategy and representation. Expanding knowledge of field survey methodology, report writing, mapping and data manipulation.

2019 – 2022 **Land Services Officer (Volunteer Coordinator)**
Hunter Local Land Services, Department Regional NSW

2016 – 2019 **Ranger – Site Supervisor,**
Belmont Wetlands State Park, Belmont NSW

2009 – 2011 **Landcare Project Coordinator**
Glenelg Hopkins Catchment Management Authority
Warrnambool VIC

2007 – 2008 **Biodiversity Threats Ranger (Pest Management) Tauranga**
Department of Conservation New Zealand

2003 – 2008 **Park Ranger (T1, T2 and T3)**
Northern Territory Parks and Wildlife Service, Various Locations

2002 – 2003 **Seasonal Ranger**
Parks Victoria, Various Locations

2001 – 2002 **Natural Reserves Team Member**
Frankston City Council, Mornington Peninsula, VIC

Ben Graham

Curriculum Vitae

Ben works with AEP in the role of Ecologist. He is expected to graduate with a Bachelor of Environmental Science and Management (Ecology and Conservation) in November 2023. Ben's studies and past experience in a variety of roles developing data analysis, reporting, land rehabilitation, biodiversity offset management, leadership and WHS skills add to his growing ecological knowledge and experience.

Qualifications

- Currently undertaking a Bachelor of Environmental Science and Management (Ecology and Conservation) Charles Sturt University; to be completed November 2023
- Bachelor of Engineering (Chemical) University of Newcastle (2015)

Further Education & Training

- First Aid and CPR (HLTAID001, HLTAID002, HLTAID003) (Completed on 10/02/2021)
- C-Class Driver's License NSW

Fields of Competence

- Training in the use of mist netting, bat harp traps, Elliot traps, pitfall traps and camera traps.
- High proficiency in written and verbal communication skills
- Data management and analysis (Excel)
- Growing proficiency in GIS mapping
- Growing proficiency in floristic surveying

Relevant Employment History

Feb 2023 – Present **Ecologist**
Anderson Environment & Planning, Newcastle

Oct 2022 – Jan 2023 **Environment and Community Vacation Student**
Glencore Coal Assets Australia
Undertook biodiversity offset management, land rehabilitation actions and rehabilitated land certification assessment.

Oct 2021 – Oct 2022 **Store Manager**
Frame today
Lead and coached a team of 3 to 6 members. Provided guidance for daily activities to a high standard to achieve key performance indicators. Managed rostering, sales, customer service, quality control, workplace safety, and training.

Ma7 2016 – Sep 2018 **Junior Project Engineer**
Granite Power
Worked independently and as part of a team to carry out commissioning operations on waste heat to energy systems, including data analysis, reporting, maintenance, process control, and safety while adhering to relevant standards/regulations/procedures.

BONNI YARE

Curriculum Vitae

Bonni works with AEP in the role of Ecologist has a Bachelor of Science, majoring in Natural Resource Management. Bonni has experience in a variety of environmental work, in a professional and volunteer capacity, including flora, fauna and aquatic field surveys, reporting, GIS and mapping, habitat restoration and community volunteering.

Qualifications

- Bachelor of Science (Natural Resource Management) University of Newcastle, completed in November, 2020

Further Education & Training

- Bush Regeneration Training
- NSW Driver's Licence: Car (Class "C").
- Chemqual (RTO 70207)
- First Aid (Provide first aid HLTAID003)

Fields of Competence

- Ecological field surveys, covering terrestrial and aquatic flora and fauna
- Growing proficiency at botanical surveys

Relevant Employment History

2019 – 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.

2015 - 2016 **Green Army Participant**
Bush regeneration / supporting local land care groups

Supported local land care groups and reserve areas in weed removal and site restoration, including tree planting, seed collection and nursery work. Bird surveying and koala surveys were also carried out.

Relevant Ecological Experience

2018 - present **Field assistance**

Participated as a volunteer in various PhD and Honours projects with the University of Newcastle and University of Technology Sydney. I have experience with small mammal trapping for squirrel gliders, nest box construction, aquatic surveys, infaunal sampling and mark recapture population surveys for *Litoria aurea* (Green and Golden Bell Frog).

2019 **Undergraduate Research Project associated with NPWS**

Undertook flora and habitat surveys for a locally threatened orchid, *Diuris praecox*, supervised volunteers, data analysis and project write up.

2019 **Volunteer Botanical Training Program**
Australian National Herbarium

Understanding of Herbarium practices, including fieldwork, use of databases, maps and GPS, botanical terminology and up to date taxonomic information, curatorial experience including identification and processing of specimens.

2018 **Stream sampling using macroinvertebrates as bioindicators**
Newcastle Council

Contracted to finish stream sampling for the community program, Waterbug Blitz, which involved water quality testing of Newcastle's urban streams.

Brendon Young

Curriculum Vitae

Brendon works with AEP in the role of Ecologist. He graduated with a Bachelor of Applied Science (Honours) and a Masters in Environmental Management, majoring in fish conservation and management. Brendon has previously worked in large retail operations in staff and budget/data management, reporting and quality assurance which adds to the experience that he currently contributes to the AEP team.

Qualifications

- CPR and First Aid (Completed on 30/11/21)
- White Card (Completed on 11/02/22)

Further Education & Training

- Master of Environmental Management (Natural Resources)
- Graduate Certificate of Fish Conservation and Management (Charles Sturt University)
- Bachelor of Applied Science (Fisheries) with Honours

Fields of Competence

- Training with aquatic sampling techniques such as seine nets, gill nets and fyke nets.
- Training in the use of mist netting, bat harp traps, Elliot traps, pitfall traps and camera traps.
- Experience identifying fish, reptiles, insects, and plants to species level through honours research and other projects while studying.

Relevant Employment History

2022 – Present **Ecologist**
Anderson Environment & Planning, Newcastle

2013-2022 **Department Manager**
Woolworths Pty Ltd

Provision of leadership and coaching for a team of 5 to 20 members. Coach and guide daily activities to a high standard and achieve key performance indicators. Manage wage, sales, and wastage budgets. Plan for periodical events and long-term direction of the department.

March 2019-Oct 2019 **Produce Quality Control Officer**
Woolworths Pty Ltd

Inspection of produce as it arrives at the warehouse to ensure the required specifications for quality, size, weight and ripeness were met. Rejection of stock that did not meet company specification.

Craig Anderson

Curriculum Vitae

An environmental professional with over 20 years experience providing high level ecological services, advice, strategic direction and management for sectors such as land development, infrastructure, conservation, government, legal, mining & quarrying.

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).
- NSW Scientific Investigation Licence SL101313
- NSW Animal Research Authority
- NSW Accredited Biobanking Assessor No. 150
- NSW Biodiversity Accredited Assessor BAAS: 17002

Further Education & Training

- 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 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

Relevant Employment History

2013 – Present	**Director/Principal Consultant** Anderson Environment & Planning, Newcastle
2012- Present	**Director** Habitat Indoor/ Outdoor Living, Furniture, Homewares & Design, Newcastle.
2010-2012	**General Manager Sustainable Development** Coal Mining Company, Cockatoo Coal PtyLtd, 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
2001-2006	**Manager Environment Group/ Director**
	Harper Somers O'Sullivan, Development Consultants, Newcastle
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.

Ian Benson

Curriculum Vitae

Ian works with AEP in the role of Director and Principal Ecologist. He is an experienced field ecologist, bird watcher and a regular participant in wader surveys. Ian has previously had a successful career as a project manager with a local geotechnical engineering firm. His background in project management and soil sciences combined with his ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Graduate Diploma in Science (Ecology) University of New England (2014)
- Bachelor Engineering (Civil) University of Newcastle (2008)

Further Education & Training

- Biodiversity Accredited Assessor System (BAAS 18147)
- Advanced Plant Identification (University of New South Wales)
- NSW Class C Driver's Licence. Experienced 4WD operator
- Occupational Health & Safety Training
- Remoted Piloted Aircraft Excluded Category Training with Aviassist Pty Ltd
- Rail Industry Worker
- ARTC Safety Induction for Contractors (NSW)
- ARTC Hunter Bulk Terminal Induction

Fields of Competence

- Biobanking & Biodiversity Offset Commissions – initial scoping and feasibility, BAM impact assessments and BDAR reporting, biobank calculations, Stewardship site creation
- Detailed knowledge of environmental legislation and approval pathways
- Ecological field survey and habitat assessment covering terrestrial and aquatic flora and fauna. Experienced in camera trap methods particularly targeting cryptic and difficult to identify mammal species.
- Highly proficient at avifauna surveys, including challenging wetland and shorebird environs
- High level of experience undertaking nocturnal survey of arboreal mammals and nocturnal birds
- Project Management

Relevant Employment History

2022 – Present — **Director & Principal Ecologist**
Anderson Environment & Planning, Newcastle

Ian is a Director of Anderson Environment & Planning whilst continuing in the role of Principal Ecologist overseeing a team of approx. 35 professional ecology staff and all aspects of the business including training and management of field and office staff undertaking ecology and bushfire works to assist in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

2019 – 2022 — **Principal Ecologist**
Anderson Environment & Planning, Newcastle

2018-2019 — **Senior Ecologist**
Anderson Environment & Planning, Newcastle

2016-2018 — **Ecologist**
Anderson Environment & Planning Newcastle

2012 – 2016 — **Project Manager**
Douglas Partners, Newcastle

As a project manager with Douglas Partners Ian was responsible for proposal and tender preparation, planning, implementation and reporting of geotechnical and geo-environmental investigations for a broad range of projects including site classification, foundations, pavements, bridges and slope stability. Ian was required to liaise with clients regarding project requirements, project goals and deadlines. He was responsible for the development and implementation of Work Health and Safety Plans as well as Environmental Plans and documentation. This included the development of safe work procedures, safety inspections on site and implementing improved safety procedures with staff. Ian was responsible for ensuring projects were completed on time and on budget whilst meeting the clients' expectations and achieving quality assurance standards.

2008-2012 — **Geotechnical Engineer**
Douglas Partners, Newcastle

2013-Current — **Bird Surveyor**
Hunter Bird Observers Club

Volunteer survey work for Hunter Bird Observers Club for regular wader and water bird counts and Tomago and Kooragang Island.

2017-Current — **Birddata Moderator**
BirdLife Australia

Volunteer moderating and vetting bird surveys from Birdata which is the Birdlife Australia Atlas to ensure a robust database for both the Hunter Valley and Central Coast reporting areas totalling approximately 5000 surveys per year.

Key Project Experience

- Targeted surveys for *Dichanthium setosum* in Glen Innes Region;
- Target surveys for Eucalyptus cannonii, Western Rail Coal Unloader, Pipers Flat;
- White-bellied Sea-Eagle nest locating and monitoring Glenning Valley and Chisholm;
- Powerful Owl nest locating and monitoring: Salamander Bay, Soldiers Point, Anna Bay North, Wallsend, Cameron Park and Edgeworth;
- Accredited Assessor for approved Biodiversity Development Assessment Reports:
    - Berkeley Vale Road, Glenning Valley;
    - Railway Road, Warnervale;
    - Barden Ridge Townhouses;
    - McFarlane's Road, Chisholm;
    - Fairlands Road, Medowie;
    - Rosella Rise, Warnervale;
    - Carr's Road, Neath;
    - Jack Grant Avenue, Warnervale;
    - Minnesota Road, Hamlyn Terrace;
    - Bellbird North;
    - Waterford, Chisholm;
- Ecological Assessment Report for Proposed Modification To Approved Western Rail Coal Unloader At Pipers Flat;
- Spot Analysis Techniques surveys: Nelsons Plains, Wallsend, Anna Bay, Boat Harbour, Salamander Bay, North Arm Cove, Warnervale, Hamlyn Terrace, Kincumber, Palmdale, Wyee, Charlestown, Chisholm, Gillieston Heights, Mount Vincent, Radford Park, Cessnock
- Infrastructure;
    - Gwandalan Recycled Water Main;
    - Lower Belford Water Main;
    - Raymond Terrace Rising Main;
    - Astra Street Landfill Rehabilitation Assessment;
- Cat Tracker Pilot Program Associated With The Hunter Estuary Wetlands for Hunter Local Land Services;
- Surveys for Squirrel Glider (*Petaurus norfolcensis*) Warnervale Area June 2020

- Biodiversity Stewardship Agreements including:
    - • Bobs Farm (approved);
    - • Cedar Brush Creek (ready for signing);
    - • Girvan (final assessment);
    - • Mardi (under assessment);
    - • Wallsend (report being drafted);
    - • Ellalong (report being drafted);
    - • Blueys Beach (surveys continuing);
    - • South-West Rocks (surveys continuing).

Kelly Drysdale

Curriculum Vitae

Kelly works with AEP in the role of Ecologist. She has extensive experience in various land management operations in several regions, with both small and large enterprises, in Australia and internationally. Her strong environmental stewardship knowledge, lateral thinking, project and change management, business development, strategic planning and human resource management skills are adding value to the AEP team.

Qualifications

- Certificate IV in Training and Assessment TAE40110, TAFE Hunter Institute, NSW 2016
- Graduate Certificate in Business Administration (with honours), Newcastle University, Newcastle, NSW 2013
- Associate Diploma of Applied Science (VITICULTURE), Charles Sturt University, Wagga Wagga, NSW 1992

Further Education & Training

- Australian Rural Leadership Foundation Program, Fellow 2011
- Class C NSW Drivers Licence Class, Defensive Driving, FL & experienced 4WD operator
- First Aid Certificate inc CPR 2021
- SafeWork NSW Construction White Card CGI1713214SEQ01
- Working with Children WWC1170489E
- Farm Chemical User Accreditation Certificate III (ChemCert Australia)
- Negotiation skills (Rogen International), Crucial conversations (ME Consulting)
- Media Training (Doyle Media Services*)*
- Various WHS management training, legislation and compliance courses, EEO, cultural competency and diversity in the workplace
- Workplace Trainer and Workplace Assessor
- Open Water PADI Dive Certificate

Fields of Competence

- Field assessment including: targeted fauna and flora surveys, BAM plots, Koala Spot Assessment Technique (SAT) surveys, tree surveys, HBT and nest box inspections.
- Assessment of sites using the Biodiversity Assessment Method (BAM) under the Biodiversity Offsets Scheme, production of Biodiversity Development Assessment Reports and Ecological Assessment Reports
- Production of assessments against various legal instruments such as EPBC Act fauna and flora assessments, State Environmental Planning Policy Biodiversity and Conservation) 2021 – Chapter 4 Koala Habitat Protection 2021, State Environmental Planning Policy (Resilience and Hazards) 2021 – Chapter 2 Coastal Management, and the Environment Protection and Biodiversity Conservation Act 1999
- Bushfire threat analysis and reporting
- Liaison with clients/site/company/government representatives

Relevant Employment History

February 2021 – Current **Ecologist –** Anderson Environment & Planning, Newcastle, NSW

Assisting in the provision of consulting services to land, property, mining industry, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation.

Aug 2019 - July 2021 **Business Development Manager -** RLF

Business development and strategic targeting of corporate and larger enterprises leveraging a vast network of contacts in the Australian Wine Industry and Agricultural sector to add value to farming systems with agronomic and fertiliser solutions.

Jul 2015 - Aug 2019 **Viticultural & Trade Resource Manager**- Hope Estate, Pokolbin, NSW

Operational and strategic management of five estate owned vineyards in NSW, WA & VIC. CRM & BDM of wine and beer portfolio of on/off premise sales on >1,800 customer base with PR responsibilities and hosting of events.

Jul 2017 - Aug 2019 **Casual teacher in Viticulture & Wine -** Kurri Kurri Tafe NSW

Revising, formulating and developing resources for and delivering all units of competency in the AHC51516 Diploma of Viticulture and strengthening relationships within the Hunter wine region.

Jul 2014 – July 2015 **Sales Acquisition Agent** – Wine Selectors & Choice, NSW

Wine appraisals, wine sales, developing staff training manuals, exceeding sales targets.

Jan 2004 - May 2010 **Viticultural Manager –** Casella Family Brands, Yenda NSW

Primarily responsible for the effective and efficient viticultural, land management operations and programs reporting to the company directors on 1,800ha with up to 160 staff. Primarily viticulture but also managed a large prune/plum orchard, broad acre cropping-dry and pivot, cattle, biodiversity tree planting program, compost making, winery waste water treatment plant and traded water.

June 2002 - Jan 2004 **Viticulturist** - Brown Brothers**,** Milawa VIC

Grower liaison for 84 growers and 5 diverse company owned vineyards; strategic plan development, asset assessments and evaluations.

June 2001 - June 2002 **One-year overseas travel - study/work tour**

Studied wine and agricultural markets in Asia and London, travelled through Italy, Switzerland and Spain's wine regions and worked vintage periods in Portugal, France and mostly in South Africa- Flagstone Wines, Cape Town, sourcing fruit from 48 vineyards across the Western Cape.

May 2000 - June 2001 **Viticultural Projects Manager** – Nepenthe**,** Adelaide Hills

Viticultural consultancy, contract management, development and management of investment projects, costing systems, reporting and management protocols.

Jan 1998 - May 2000 **General Manager –** Pertaringa Wines, McLaren Vale, SA

Strategic operational and financial planning for company land portfolio and brand development, including contract management for clients and winery liaison with 15 customer wineries.

Dec 1992 - Jan 1998 **Viticulturist** –Southcorp Wines, SA

Grower Liaison in McLaren Vale, Technical Officer in Barossa/Clare/Adelaide Hills and Riverland, Greenfield Vineyard Development in Barooga and Robe, and Vine Propagation Manager for the group successively.

1993 - Vintages **Cellar hand** - Murphy-Goode Estate Winery- Alexander Valley, California USA and Willamette Valley Vineyards- Willamette Valley, Oregon USA and CSUR, Wagga Wagga, NSW

NAOMI STACKHOUSE

Curriculum Vitae

Naomi works with AEP in the role of Ecologist. She is in the process of completing a Bachelor of Science Advanced, majoring in Ecology, Biodiversity and Conservation Science. Naomi has worked in various roles unrelated to the science field over the past 7 years. She has worked at AEP since November 2021, and in addition to this, she has undertaken numerous volunteering projects in the environmental sector. She has experience with the Australian Wildlife Conservancy, and is a current volunteer at Hunter Wildlife Rescue. These experiences have given her experience in wildlife handling, data management, report writing, ecological surveys, flora & fauna identification, reporting and ecological restoration.

Qualifications

- Bachelor of Science (Advanced), Ecology, Conservation and Biodiversity Major. University of Newcastle, due for completion in June 2023.

Further Education and Training

- Class C NSW Driver's Licence
- Animal Handling and Rescue Certificate (NATF)
- General First Aid + CPR
- Introduction to Temperate Marine Biology (UTAS)

Fields of Competence

- Flora & fauna surveying both terrestrial and aquatic environments
- Growing proficiency in botanical surveys
- High proficiency in written and verbal communication skills
- Wildlife handling experience
- Gaining skill in document control and Environmental legislation at a local and state level.
- Data management and the use of Excel and Word.

Relevant Employment

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.

2022 **Wildlife Rescue and Transport**
Hunter Wildlife Rescue

2021 **Volunteer Field Assistant**
Australian Wildlife Conservancy

2020-2021 **Fieldwork Research Assistant**
Newcastle University

Natalie Black

Curriculum Vitae

Natalie works with AEP in the role of Senior Environmental Manager. She has extensive knowledge in environmental management, environmental planning, and report writing and assessment. With a detail understanding of planning, catchment management, coastal management and rehabilitation. Natalie has had a successful career with both state and local government in conservation, planning and field investigation roles. Natalie has also gained extensive communication skills and project management through her previous career in lecturing. Her background and experience in the ecological and planning fields is utilised in a diverse array of application in her current role.

Qualifications

- B.Sc (Hons), University of Newcastle, 2002 Sustainable Resource Management and Marine Science.
- Master Planning, University of Technology Sydney 2007.
- Certificate IV Training and Assessment at NSW TAFE 2012.
- BAM Assessor; accreditation number: BAAS19076.

Further Education & Training

- Evidence Gathering and Legal Process (Australian Institute of Environmental Health).
- Conflict Resolution Course (LGSA).
- Report Writing Course (LGSA).
- Powerful Presentation (LGSA).
- NSW Rural Fire Services Bush Fire Assessment
- Relocation of Threatened Species (Botanical Gardens Sydney).
- Sustainable Home Assessment Reduction Revolution.
- Flora and Fauna Survey Assessments Niche Environment and Heritage.
- First Aid TAFE.

Fields of Competence

- Environmental Planning
- Environmental Management and rehabilitation of catchments coastal waterways. Statement of Environmental Effects (preparation and assessing).
- Fish Passage
- Marine ecosystems including; mangroves, seagrasses, algae, Fauna and habitat assessment.
- vegetation.
- Communicating with a wide range of stakeholders.
- Development Application.
- Education in both Environmental and Planning industries.
- Koala Plans of Management.
- Policy Development.

Relevant Employment History

2019 – Present	**Senior Environmental Manager**
	Anderson Environment & Planning, Newcastle
2010 - 2019	**Principal Environmental Planner**
	Black Earth
2003-2010	**Natural Resource Manager and**
	Development Assessment Officer
	Lismore City
2002- 2003	**Jervis Bay Indigenous Fishing Strategy**

SIMON PURCELL
Curriculum Vitae

Simon works with AEP in the role of Senior Ecologist. Simon has over 7 years of professional experience managing projects in the fields of terrestrial ecology, mining and mine rehabilitation and environmental management.

Qualifications

- Bachelor of Applied Science, Major Wildlife Science, University of Queensland Gatton 2013
- Certificate III in Animal Care and Management, Companion Animal Services (2008)

Further Education & Training

- NSW Class C Driver's Licence

Fields of Competence

- Terrestrial Ecology field survey, covering terrestrial flora and fauna
- Project Management

Relevant Employment History

2020 (November) -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, advices, strategy and representation.

2018-2019 **Team Leader / Ecologist**
Ecotone Flora Fauna Consultants, Weipa, QLD

- Conducted client liaison meetings, providing ecological advice and recommendations for flora, fauna and land management, complying with Queensland state and Commonwealth environmental legislation.
- Wrote proposal and executed surveys for Prefeasibility studies and EIS on Western Cape York for multi-national mining company complying with Commonwealth environmental legislation.
- Negotiated increases to budget and survey requirements with the client in relation to ongoing changes and project requirements
- Led high level discussions with the client to provide new services.
- Developed wide scale camera monitoring program to assess presence /absence of EVNT fauna within the survey site.
- Complex logistical planning for remote work
- Co-developed and implemented new safety system within the business

- Mentored project managers through training, and leadership guidance to ensure quality and standards of business were met
- Managed human relation matters within the business
- Digitally transformed infield data collection through roll out of ArcGIS Collector, leading to the reduction in the use of paper in the field.

2014-2018 **Team Leader / Ecologist**
Ecotone Flora Fauna Consultants, Weipa, QLD

- Lead project manager (6 years) for all aspects of mine / drill preclearing environmental surveys across three different mine sites and exploratory sites, including during the construction phase of a new mine in the Weipa region.
- Project managed and participated in numerous annual EVNT projects that led to cultural and process practices changing within a multinational mining company.
- Played a critical role in maintaining client and stakeholder relationships and built stability with onsite leadership to further grow business opportunities.
- Maintained client confidentiality on sensitive and impactful projects.
- Ensured all projects complied with Queensland state and Commonwealth environmental legislation and clients Environmental Authority.
- Assisted in the development of growth and innovation projects such as cloud-based document storage solution to support multi-site users.

2013-2014 **Field Technician / Ecologist**
Ecotone Flora Fauna Consultants, Weipa, QLD

- Pre-clear flora and fauna mining and drilling programs
- Baseline fauna surveys of future mining areas
- Sensitive vegetation ground truthing
- EVNT flora and fauna surveys
- Seed Processing (storing, drying management of inventory)
- Mixing of seed in preparation for annual rehabilitation season

2010-2012 **Mine Operator and Trainer**
Rio Tinto, Weipa, QLD

- Acted as Crew Leader to manage 30 mine operators, production targets and minimising environmental impacts
- Skilled Caterpillar 992G, 993K & Komatsu WA900 Loader and 776D, 777F and 785C Caterpillar haul truck operator
- Crew Trainer/Assessor - completed five certificate IV modules to Training and Assessing.

2009 - 2010 **Parks and Garden Maintainer**
Spotless Group, Weipa, QLD

- Attained six competencies towards Certificate III Forest Growing and Management.
- Maintained local green spaces and houses.

2009-2009 **Vet Nurse**
Tableland Veterinary Service, Weipa, QLD

- Prepared surgery for surgeries including use of autoclave to sterilise implements
- Administered sedation via injections in the muscle and intravenously
- Prepared and monitored animals before, during and after surgeries
- Monitored animal and anaesthetic during surgery focussing on breath rate, colour of gum and pupil movements
- Took blood samples from veins and prepared samples of foreign bodies for analysis
- Successfully directed and carried out on-call emergency cases with vet assistance over the phone

2003 – 2009 **Manager**
The Pet Centre, Sydney, NSW

2001 – 2003 **Sales Assistant**
The Pet Centre, Sydney, NSW

- Implemented standard procedures for staff to follow
- Focussed on achieving a high level of OHS standards within the store
- Responsible for daily takings up to five thousand dollars per day
- Accountable for people management including rosters, recruitment and managing employee issues
- Responsible for management of store inventory
- Developed skills in handling a range of domestic animals
- Maintained animal's health and welfare in store and complied with state laws and regulations
- Analysed store's and customer's aquarium water quality
- Developed sound knowledge of animals including their origin, identification and general requirements

Relevant Volunteer Experience

2012 **Fauna Spotter / Field Assistant**
Humble Bee Films

- Volunteered as a fauna spotter/field assistant with Dr Brad Purcell and Humble Bee Films in a ten day research camp, during the production of the natural history documentary "Dingo".

2012 **Volunteer Ecological Field Assistant**
Rio Tinto, Weipa, QLD

- Participated in an ethno-botanical workshop with Rio Tinto Alcan Land and Rehabilitation team.
- Participated as a field technician during pre-mining survey work. The work included assessing flora and the land formations to identify buffer zones for natural drainage systems and sensitive areas in the Andoom mine site Weipa.

2012 **Fauna Technician**
Brad Purcell PhD,
Greater Blue Mountains World Heritage Area

- Field technician for Brad Purcell during his doctoral research project on dingoes in the Greater Blue Mountains World Heritage Area. Developed skills in use of VHF radio tracking to retrieve collars, triangulation method to determine positioning of dingoes or deployed collars and traversing bushland.

Tim Moulton

Curriculum Vitae

Tim works with AEP in the role of Ecologist. Tim has over 10 years of professional experience managing projects in the fields of ecology, natural area restoration, biodiversity conservation, community education, and construction environmental management. Tim also has 5 years experience working in the field as a bush regenerator.

Qualifications

- Bachelor of Environmental Science University of Newcastle (2001)
- Conservation Land Management Certificate II Tafe (2003)
- Master of Environmental Science Southern Cross University (2008)

Further Education & Training

- Biodiversity Assessment Methodology (BAM) Accredited Assessor (BAAS: 19083)
- NSW Class C Driver's Licence. Experienced 4WD operator.
- OH&S NSW White Card
- Erosion & Sediment Control Training (4 day Blue Book course / CPESC)
- Feral Animal Control training (1080 & Pindone baiting)
- Certificate 3 in Chemical Application (AQF3)

Fields of Competence

- Ecological field survey, covering terrestrial and aquatic flora and fauna
- Highly proficient at botanical surveys and establishing monitoring programs
- Project Management and auditing
- Restoration Science

Relevant Employment History

2019 - present **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, advices, strategy and representation.

2015 - 2018 **Senior Project Officer / Ecologist**
Conservation Volunteers Australia / WetlandCare Australia

- Project managing on-ground restoration works including revegetation, site stabilisation, weed control and bush regeneration.
- Facilitating community engagement events, and supervision of volunteers.

- Undertaking site assessments, ecological surveys, and preparing plans of management.
- Scoping and preparing grant applications, managing all aspects of grant delivery, budgets, and reporting.

2009 - 2015 **Senior Ecologist / Environmental Scientist**
Onsite Environmental Management

- Undertaking and project managing detailed environmental assessments including flora and fauna surveys, threatened species assessments, management plans and monitoring reports.
- Environmental site management, monitoring and compliance auditing on large scale infrastructure projects and extractive industries.

2008 - 2009 **Bush Regenerator / Leading Hand**
Lane Cove Council, Australian Wetlands

- Undertaking bush regeneration activities including removal of environmental/noxious weeds, track construction and maintenance, native seed collection and propagation, fire assisted regeneration, feral animal control and supervision and training of volunteers.
- Supervising bush regeneration and weed management teams.
- Undertaking large scale revegetation works on infrastructure projects involving mass tubestock planting, site stabilisation and maintenance weeding.

2006 - 2007 **Ecologist / Environmental Scientist**
GeoLINK Consulting

- Undertaking and project managing detailed environmental assessments including flora and fauna surveys, threatened species assessments, management plans and monitoring reports.
- Monitoring and analysis of wetland, groundwater, and domestic wastewater systems.

2002 - 2006 **Bush Regenerator / Leading Hand**
Gondwana Bush Restoration, Willoughby City Council

- Undertaking bush regeneration activities including removal of environmental/noxious weeds, track construction and maintenance, native seed collection and propagation, fire assisted regeneration, feral animal control and translocation of vegetation.
- Supervision and training of bush regeneration teams and volunteers.

2001 - 2002 **John Holland Construction**
Environmental Officer

- Environmental site management and monitoring and reporting on large scale infrastructure projects.

Relevant Volunteer Experience

2014 - CurrentBurwood Beach Coastcare - Facilitator (Volunteer)

Supporting and managing volunteers, on-ground works, promotion and funding opportunities on a monthly basis, to undertake conservation and restoration activities within Glenrock State Conservation Area (NPWS estate).

2013 - 2016 Humane Society International – EPBC Act Nomination Support

Preparation of Threatened Ecological Community (TEC) nominations under the Commonwealth Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act).

WARWICK MUIR

Curriculum Vitae

Warwick works with AEP in the role of Senior Ecologist and Arborist. 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)
- Diploma of Arboriculture (AQF5) (2021)

Further Education & Training

- First Aid Certificate
- Class C NSW Drivers Licence
- Construction White Card
- Level 1 Tree Access Systems certified.

Relevant Employment History

Feb 2020 – Current **Senior Ecologist/ Lead Arborist (AQF5)**
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 arboricultural, ecological, project management, environmental, planning services, advices, strategy and representation.

Volunteer Experience

- Bush Regeneration Volunteer, Newcastle Landcare
- Field data collection for environmental Honours and PHD candidates in various locations.

Ecological Field Experience

University

- 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.

AEP

Warwick has conducted and directed ecological surveys across multiple large and small sites including;

- Threatened fauna surveys;
    - Spotlighting, stagwatching and nocturnal surveys;
    - Camera Trapping including deployment, collection and interpretation;
    - Scat Assessment Technique and nocturnal surveys for Koalas;
    - Diurnal Bird Surveys;
    - Pitfall and Elliot trapping;
- Threatened Flora searches by transect and point methodology;
- Site Flora Assessment utilizing the BAM methodology;
- Site Habitat Assessment including HBT identification
- Exotic Species Surveys and mapping; and
- Arboriculture Survey including Tree Identification, Landscape Significance and Retention Value.

BIODIVERSITY | BUSHFIRE | ARBORICULTURE

NEWCASTLE SYDNEY

Our Ref: **3063.03**

Date: **22 March 2024**

To **Monteath & Powys**

ATTN: **Jamie Graham**

Via Email **J.Graham@monteathpowys.com.au**

Dear Jamie,

RE: RFI to DA 16-2023-685-1 at 42 Fullerton Cove Road Fullerton Cove, NSW Lot 14 DP258848 as requested by Port Stephens Council

At the request of Monteath and Powys Ltd Pty, Anderson Environment & Planning (AEP) herewith provide a response to address the Ecology portion of the above mentioned RFI:

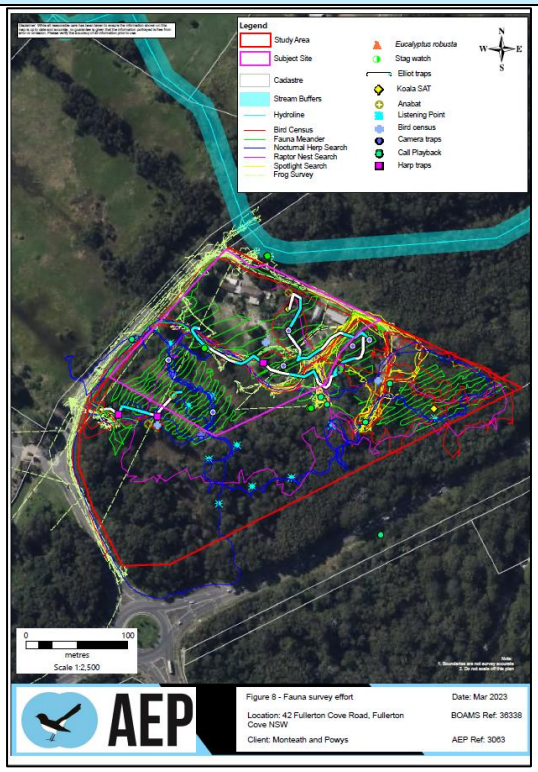
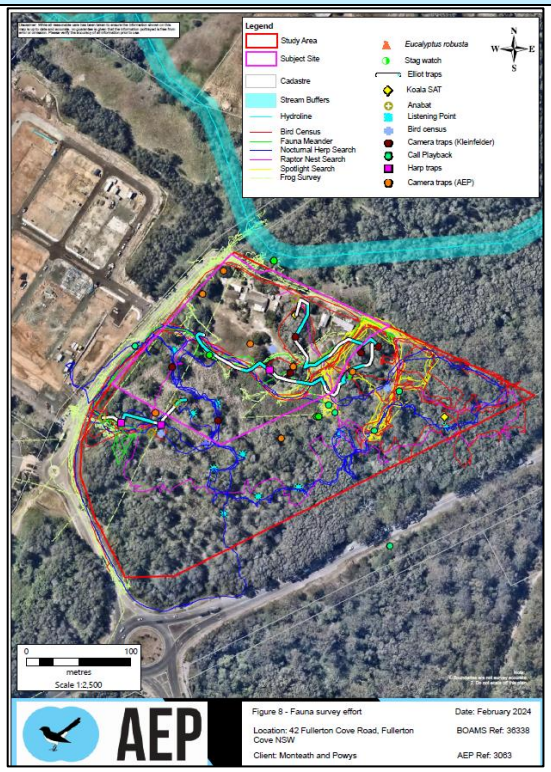
Port Stephens Request for Further Information - Ecology	AEP Response
1. Please provide further details demonstrating that frog surveys (Wallum Froglet, Green and Golden Bell Frog, Green-thighed Frog and Mahony's Toadlet) have met the requirements of the 'NSW Survey Guide for Threatened Frogs', or frog surveys will need to be redone in accordance with the requirements of the 'NSW Survey Guide for Threatened Frogs'. Please note that the survey period for all candidate frog species is available until the end of March. In accordance with the 'NSW Survey Guide for Threatened Frogs': i. Frog surveys must be undertaken by an ecologist with demonstrated experience and skills in frog survey as detailed in Section 2.2 of the 'NSW Survey Guide for Threatened Frogs'. ii. It is expected that frog surveys be undertaken nocturnally i.e. after last light. iii. Frog survey methods must follow methodologies outlined in Section 2 of the 'NSW Survey Guide for Threatened Frogs'. iv. Surveys must meet species specific requirements i.e. minutes spent on site (please refer to Section 2.8) and rainfall conditions as specified by the 'NSW Survey Guide for Threatened Frogs'. v. The BDAR must document the survey effort in accordance with Section 2.11 of the 'NSW Survey Guide for Threatened Frogs'.	i. In accordance with Section 2.2 of the "NSW Survey Guide for Threatened Frogs', three (3) Ecologists from AEP as well as three (3) Ecologists from Kleinfelder undertook amphibian surveys within the Study Area. The AEP survey team was led by Warwick Muir (Bsc (Biology); DipArb (AQF5)) and assisted by Matt Booker (B.Env Sc & Mgmt) and Kelly Drysdale (Ass.Dip. App Sc, Grad Cert BA, TAE). Mr. Muir has four (4) years' experience working as a qualified ecologist at AEP, with suitable experience performing threatened frog surveys (refer **Attachment B** updated resume). Ms. Drysdale and Mr. Booker have experience in frog surveys, however due to drought and site conditions have not personally identified the Fullerton Cove targeted threatened species in the field however all resumes have been updated to reflect relevant experience in survey methods (e.g. aural/visual surveys, call playback, dip netting, acoustic recorders) and demonstrated success in threatened frog identification in NSW. Additionally, all staff at AEP are supported by a senior management team (over 35 years' experience in ecological surveys within the Port Stephens Local Government Area) that were available for consultation in regard to frog call and photo identification. Multiple teams were out over those two nights when sufficient rainfall was received that were all briefed prior and all findings shared after. Additionally Ms Lucy Gill is also part of the AEP team as a frog specialist with qualifications: B Env Sc & Mgmt – Ecosystems and Biodiversity Major & B Env Sc & Mgmt (Hons). Lucy has gained valuable skills in a variety of environments, including chytridiomycosis

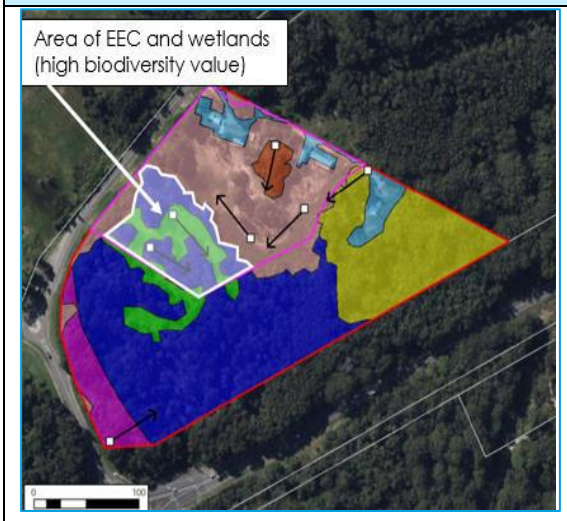
Port Stephens Request for Further Information - Ecology	AEP Response
	processing and screening via qPCR, nest box monitoring, trapping and capture-mark-recapture methods. She has utilised bioacoustic software and hardware to identify the breeding phenology and activity of the endangered Northern and Southern Heath Frog, with publications of these findings coming in the near future. Majority of her professional experience to date has been within the research and conservation field specialising in amphibian conservation biology and herpetology - including ecological modelling, spatial analysis, dataset and specimens management, laboratory research, citizen-science based approaches, community engagement, grant applications, survey planning and logistics, animal technician duties and client engagement. Overall, the AEP team have well demonstrated experience and skills in frog survey as we do with all flora and fauna specialist areas in a broad team of 60+ employees. ii. Kleinfelder performed four (4) nights of amphibian surveys in which frogs were identified by call and by spotlighting (inferring darkness), thus these surveys were undertaken after last light. AEP also performed two (2) nights of amphibian surveys in which amphibians were identified auditorily and by spotlighting in areas of suitable vegetation. These surveys were conducted after habitat assessments and desktop investigations were performed utilising BioNet records; refer **Table 1** below. BioNet searches revealed that the Green-Thighed Frog (*Litoria brevipalmata)* has not been historically identified as inhabiting the Study Area or its local surrounds. Current research indicates this species is "*almost exclusively confined to natural or artificial ephemeral water bodies*" (Lemckert et al. 2006). Given the lack of historical records, permanent waterbodies, and potentially unsuitable breeding habitat (given the high levels of salinity) within the Study Area, surveys for this species are deemed adequate. The Wallum Froglet's (*Crinia tinnula*) preferred habitat is melaleuca swamps accompanied with poor drainage, which was identified on site. However, this species requires acidic water (pH 4.3-5.2) which is not present within the brackish waters located within the local surrounds. This is supported by the distribution of historical records within the BioNet data, whereby records of this species are confined to areas with higher acidity. Given the unsuitability of the habitat on site, also with the absence of any BioNet records within the Study Area, surveys completed for this species have been adequately undertaken.

Port Stephens Request for Further Information - Ecology	AEP Response
	Similarly to *C. tinnula*, Mahony's Toadlet (*Uperoleia Mahonyi*) research indicates this species prefers an acidic environment and not the more alkalotic environment brackish waters offer. This is supported by the distribution of historical records within the BioNet data, whereby records of this species are confined to areas with higher acidity levels. Additionally, research indicates that this species is "*much more likely to be detected when surveyed for from sunset and after dark (i.e. from 6 pm during the main calling period)"* (De Angelis & Cleeland, 2023), thus surveys performed by AEP ecologists were completed at an appropriate time to target this species. Green and Gold Bell Frog (*Litoria aurea*) was not identified as occurring historically within the Study Area according to BioNet records with 14 records within a 10km search area of the Subject Site. This species is known to tolerate the high pH of brackish waters; however research has indicated that higher levels of salinity may disrupt breeding cycles, which may account for the absence of this species. Additionally, this species requires slow moving, permanent waterbodies for breeding, which were not located within the Study Area. The Study Area does contain potential foraging habitat and given this species tolerance of higher salinity levels; the survey effort was designed to optimally target this species. The surveys conducted by AEP ecologists were performed at sunset instead of last light as this is a diurnal species and the only threatened amphibian species with suitable habitat located on site. Overall, there is a shallow brackish waterbody within the Study Area in the south, a mapped hydroline to the north outside of the Subject Site and some areas within the site is dominated by *Typha orientalis*, but there are no permanent waterbodies within the Subject Site. The groundtruthed PCTs were 1646, 1717, 1728 and 1737, which contain alluvial soils and a slight alkaline environment. Due to the lack of waterbodies (ephemeral or permanent) no frogs were heard nor observed within the Subject Site during the frog surveys undertaken by AEP. One frog species was observed and heard within the Study Area. *Crinia signifera* (Eastern Common Froglet) was the only frog observed and heard during the frog surveys. *C.signifera* was heard observed within the Study Area but not the Subject Site. This frog is known for occupying brackish waters and has been shown to tolerate moderate to high salinity levels, with tadpole mortality only occurring in extremely high saline environments (e.g. pure sea water) (Hopkins et al., 2020). Therefore, *C.signifera* being the only frog present on site is consistent with the breeding and foraging habitat available within the Study Area.

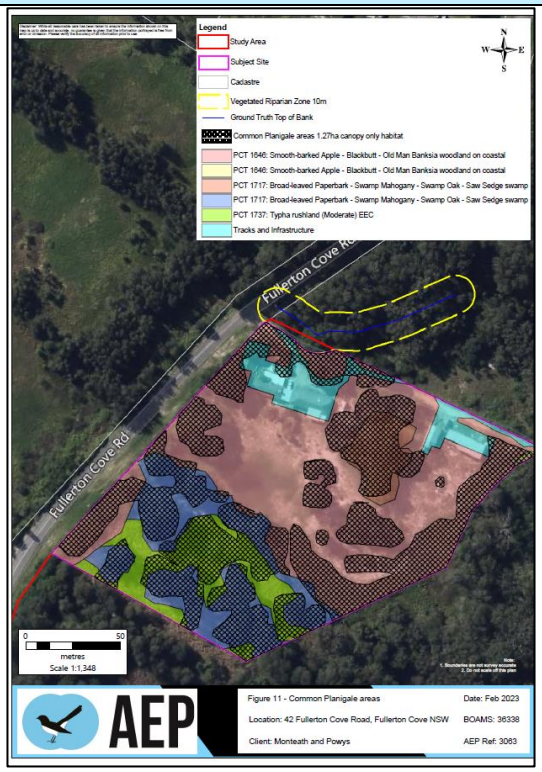
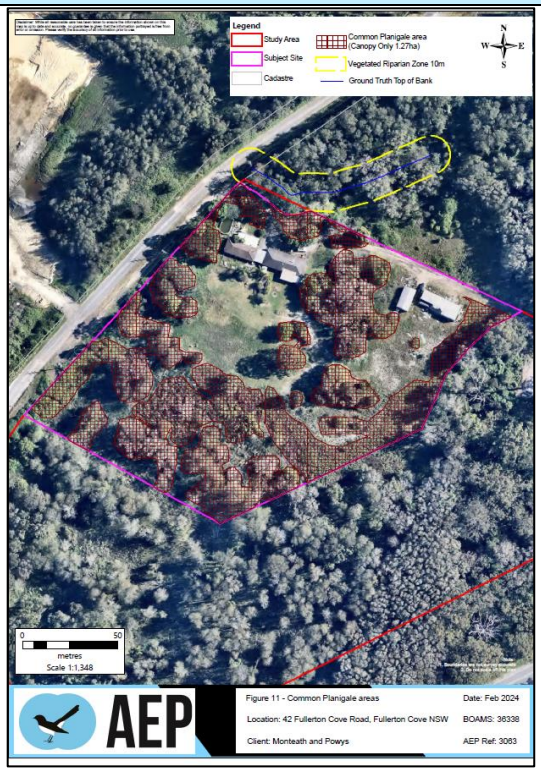
Port Stephens Request for Further Information - Ecology	AEP Response
	iii. Threatened Frog surveys were undertaken in accordance with the 'NSW Survey Guide for Threatened Frogs.' As indicated in **Table 1**, surveys by Kleinfelder and AEP were undertaken during the specified survey periods in accordance with the BAM-C of the for Green and Golden Bell Frog (*Litoria aurea*), Green-Thighed Frog (*Litoria brevipalmata*), Mahony's Toadlet (*Uperoleia mahonyi*) and Wallum Froglet (*Crinia tinnula*). As specified in Section 2.5 of the '*NSW Survey Guide for Threatened Frogs*', surveys were conducted following rainfall events. Details of these rainfall events are located within the BDAR (**Tables 15** and **16**), and are further clarified in **Table 2** below. As stated within this section "*evidence suggests most species of frog call actively at the beginning of the evening when conditions are warmest, with calling trailing off as the night progresses, However, for some species calling can extend into the day or later in the night, during suitable conditions*." Given the only threatened frog with suitable habitat was the diurnal Green and Gold Bell Frog (*Litoria aurea*), surveys were tailored to increase the likelihood of locating this species. Additionally, the ambient temperatures at the time of AEP surveys were uncharacteristically low for February, however due to drought conditions this was the most optimal time to survey threatened frogs on site. The average temperature in February when these surveys were undertaken is 27.7oC, however the average temperatures on the 22nd and 23rd of February by AEP were 20.5 and 21.5oC. These uncharacteristically low temperatures combined with minimal rainfall events resulted in AEP ecologist making the educated decision to commence surveys at sunset opposed to last light, thus utilising warmer temperatures. Section 2.6 of the 'NSW Survey Guide for Threatened Frogs,' requires surveys to be conducted in suitable breeding and non-breeding habitat. No suitable breeding habitat exits within the Study Area due to the absence of waterbodies. Non-breeding habitat is described as "*generally broad and may be related to one or more vegetation types*," thus as a precautionary measure the site was surveyed for each of the threatened frog candidate species and as a request from Port Stephens Council. This survey effort was designed with the guidelines outlined in section 2.7, whereby "*Only those parts of the subject land that are considered potential habitat require survey*." In this way the survey effort focused on the plant community types ground-truthed within the Study Area which were consistent with the habitat requirements for the amphibians in question. As demonstrated in **Figure 8** of the BDAR, survey efforts undertaken by AEP were concentrated to the northern hydroline outside of the Subject site and surveyed all PCT's on site which included PCT 1737 *Typha Rushland*

Port Stephens Request for Further Information - Ecology	AEP Response
	and PCT 1717 *Broad-leaved Paperbark*, as potentially suitable amphibian habitat on site, albeit without water bodies. Furthermore, the survey method undertaken by both Kleinfelder and AEP ecologists were consistent with the guidelines, in particular section 2.9.1, utilising aural-visual surveys. This involved spotlighting and call identification, as indicated in **Figure 8** of the BDAR, with numerous listening points included in this survey effort. Although no breeding habitat was identified on site, call-playback was also utilised as a precautionary measure. Tadpole searches were deemed inappropriate for this site given the absence of any waterbodies within the Subject Site. iv. Section 2.8 of the guidelines refers to standard level of survey involving a 500m transect and 50m2 tadpole search of water areas. As no waterbodies and minimal appropriate habitat were located within the Subject Site the survey effort was modified. As discussed above, the survey effort was concentrated off the northern hydroline and the Subject Site was surveyed throughout and plus areas outside of the Subject Site as areas were identified by AEP ecologists as the most suitable amphibian habitat within the surrounds. As stated above, all surveys were completed during appropriate rainfall events. Kleinfelder surveys were completed during 128.8mm and 14.8mm of rainfall while AEP surveys were completed during 45.6mm and 35mm rainfall. Given the historical drought records of the area, the most optimal rainfall events were utilised to perform these surveys with surveys aimed earlier whilst rainfall was occurring. Additionally, council was emailed regarding concerns about completing such surveys in the prior drought conditions, however, no response was received. v. Section 2.11 of the guidelines details the required documentation for the threatened frog surveys performed. The details of these surveys are included within the BDAR, however for ease of clarification these have been summarised in **Table 2 below**. 2.11.2 of the guidelines refers to species polygon mapping. As no threatened frog species were located within the Study Area, this mapping was not required.
2. Please amend Figure 8 of the BDAR to correct the survey tracks titled 'Fauna Meander' as these tracks are targeted flora surveys done by Kleinfelder, not fauna survey tracks.	Refer **Figure 8** within BDAR amendments.

Port Stephens Request for Further Information - Ecology	AEP Response
	 **Figure 8 also attached Appendix C**
3. Please provide camera trap locations for Brush-tailed Phascogale Surveys.	As above Refer **Figure 8** within BDAR amendments.
4. Avoidance of impacts has been considered with review of both the Kleinfelder BDAR (submitted for the Planning Proposal) and the AEP BDAR for the site. At the time of the rezoning it was considered that the area of forested wetlands / EEC in the south of the proposed development footprint provided limited habitat for threatened species. However, frog surveys have not been confirmed to meet minimum survey guidelines. Should threatened frogs occur within the wetland area of the site, this area should be considered an area of very high biodiversity value and impacts further avoided within this area (see figure below for details).	Targeted threatened frog surveys were considered by AEP to be sufficient given the habitat constraints within the Subject Site given that the NSW Survey Guide for Threatened Frogs is a guideline for within suitable habitat only. This is not an area of HBV/HEV for threatened frogs. ''High Environmental Value is used instead of 'high biodiversity value' as the criteria include features on a range of values including, but not limited to, biodiversity'' OEH 2015 Refer **Appendix A for BCD HEV Criteria assessment** Of the 6.86ha Study Area, 0.277ha of the 2.46ha Subject Site are TEC's under the BCD criteria and therefore **considered HEV.** This is equivalent to 11.2% of the Subject Site and 4% of the Study Area being impacted. PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* is recorded as 81% cleared, therefore **is a HEV** and impacts to this area for signage purposes to an area of less than 0.007ha. Frog Surveys undertaken across the site had a focused survey effort within areas close to water sources present outside of the Subject Site i.e. northern hydroline and southern wetland area not dominated by Typha with

Port Stephens Request for Further Information - Ecology	AEP Response
 **EEC and wetlands Mapped Area**	canopy trees of *Melaleuca* and *Casuarina* and holding some water as no water bodies were located within the Subject Site. Some of the wetland areas appear to have a tidal influence and are periodically inundated. Most areas of PCT 1737 lack open water due to the density of *Typha orientalis* that dominates this community with a moderate VIS of 59.1. PCT 1717 contains a large portion of the ground cover that is dominated by rushes; *Triglochin sp*. *Typha orientalis* and *Baumea articulata* and is in poor condition with a VIS of 35.5. This area was not considered to consist of breeding habitat as all required field work was undertaken to identify potential breeding habitats on the land for threatened species. Assumed breeding occurrence and maps identified breeding habitats on the land as HEV for Southern Myotis and Common Planigale Refer Species Polygons for **Figures 10 & 11** of the BDAR. Please refer to **Figure 8** of the BDAR for survey effort and it is noted that the EEC and wetlands area mapped within the Subject Site highlighted as high biodiversity value (figure to the left) of approx. 0.73 ha (or approx. 70m X 100m) contains a thick *Typha* ground cover that could not easily be transversed and was considered not required to be entered into based on no frogs calling within this area nor answering to call playback upon the fringes. The accredited assessor and AEP senior management deemed that this Typha area was too thick and impenetrable and unsafe to enter when conforming with safe work practices, hence survey tracks indicate the accessible areas, even from outside the Subject Site.  ***Typha orientalis* dominated ground cover (Kleinfelder).**

Port Stephens Request for Further Information - Ecology	AEP Response
	 **Cleared area heading into blackberry thickets and Typha dominated thicket (AEP)**
5. The species polygon for the Common Planigale must be redrawn and recalculated in accordance with the requirements detailed in the Threatened Biodiversity Data Collection (TBDC).	Refer to **Figure 11** amendment mapped to Near Map imagery that more adequately reflects the canopy present within the Subject Site. TBDC Polygon Guidelines: the species polygon is drawn to 500 m either side of the PCT ecotonal boundary, or to the other PCT boundary, whichever is smaller. Note the ecotonal zone is the boundary between a 'wet' PCT and a 'dry' PCT. Under drier conditions, the species moves into the lower elevation 'wet' PCT, and under wetter conditions it moves upslope to the higher elevation 'dry' PCT. This species was mapped to canopy only due to the highly degraded site conditions and presence was assumed as AEP could not undertake pitfall surveys due to archaeological matters, specifically the presence of Aboriginal heritage artifacts. Presence was assumed as per PSC recommendation 9/2/2023; "*Given the survey difficulties and the potential for camera trapping to be inconclusive, it may be more cost and time efficient to assume presence for this species*" as per Ashley Bacales. Assuming the whole site and increasing the credit load of Common Planigale is unreasonable given that there is minimal suitable habitat.

Port Stephens Request for Further Information - Ecology	AEP Response
	 **Figure 11 also attached Appendix C**
6. Further consideration of impact avoidance is required for the area identified in Figure 1 above. Where impacts can be further avoided / reduced they should be and this should be reflected in revised plans and a revised BDAR. For example, has it been considered whether parking could be reduced or redesigned to reduce impacts to the area of EEC and wetlands? What has determined car park numbers requirements? Could rooftop parking be incorporated into the design to further reduce impacts? Please provide details of any design iterations and how these designs responded to both the project need and the biodiversity values of the site. Where impacts cannot be further avoided, please provide details to justify impacts on the area of EEC and wetlands.	**BACKGROUND** **Local Need:** Fern Bay and Fullerton Cove are currently serviced by an IGA supermarket in Stockton, 8 km south, and a general store in Salt Ash, 14 km north. Both are within a 15-minute car ride or 30-minute bus ride, though public transport is limited. The Stockton supermarket covers around 600 sqm, mainly catering to local convenience needs. The Salt Ash store spans about 450sqm, primarily serving top-up needs. Residents are required to travel long distances for typical day-to-day convenience shopping. Further, the shift in supermarket shopping habits towards more frequent purchases of fresh items and prepared foods, coupled with less frequent shopping for packaged goods, is driving the trend of smaller, more numerous supermarkets, particularly in urban areas. The impact on Fullerton Cove and Fern Bay residents by the lack of basic supermarket facilities is considered significant. With little to no current opportunity to meet these needs or provide for the changing dynamic and trends of supermarket services within the area. In this regard, it was determined that a Supermarket development within the Fullerton Cove area would be the best means of addressing the local need and a petition was signed by more than five hundred (500) residents. **Site Selection Consideration:** An existing zone E1 area adjacent to the Seaside Fern Bay estate was considered

Port Stephens Request for Further Information - Ecology	AEP Response
	in the site selection process and rendered unsuitable due to exposure constraints to major arterial road and limited opportunity to attract passing trade. Further, the site does not maintain exposure to inward traffic due to existing vegetated lane separation, and its proximity to future residential land uses provides restricted separation options. Also, the site was proposed to be rezoned to residential during the lodgement of the Planning Proposal. In contrast, the Subject Site maintains great exposure to a major arterial road, centrally located and accessible for residents of both the Fern Bay and Fullerton Cove areas. The site is also afforded opportunities to attract passing trade. Subsequently, a Planning Proposal was lodged for the site to rezone the site from RU2 Rural Landscape to B1 Neighbourhood Centre (E1 Local Centre) and E3 Environmental Management (C2 Environmental Conservation in March 2017). Approximately 2.0 - 2.5ha of land was proposed for rezoning to E1 Local Centre, with up to 2.0 hectares designated for development. The selection of this area was informed by a site analysis that considered flooding and ecology to balance them with operational needs. The remaining portion of the site was proposed to be preserved in its natural vegetated state for rezoning to E3 Environmental Conservation (C2 Environmental Conservation). On 12 October 2020, the Department of Planning and Environment resolved to issue a Gateway Determination in favour of the Planning Proposal. The Planning Proposal was gazetted by the Department on 14 October 2022. Prior design iterations have been included in **Appendix D** which demonstrates the concerted effort to reduce impacts on any C2 zoned and the area of EEC and wetlands with approx. 14.5m increase to the buffer between the E1 and C2 zoning boundaries as displayed below in the **Final development Plan.** Further design reiterations within the E1 zoned land for development included the exclusion of the northern VRZ and the addition of impact area post an Arborist Assessment conducted by AEP 20/02/2024.

Port Stephens Request for Further Information - Ecology	AEP Response
	 **Final development Plan** **CAR PARKING CONSIDERATIONS:** Consideration was afforded to reductions in parking rates and alternative car parking arrangements including the provision of underground and rooftop car parking spaces to minimise land disturbance beyond the proposed building footprint. However, these options were rendered unsuitable for the site and the proposed development. Pursuant to the LEP, the Council may consider reductions in car parking provisions in the following circumstances. • alternative arrangements for parking demand can be provided, e.g., the provision of parking on another site proximate to the development or a courtesy bus. • Where supported by a TIA. • dedicated car sharing service spaces equipped with electric vehicle charging provisions are provided. In this regard, there is no opportunity for the development to provide alternative arrangements for parking demand. Also, it is considered onerous for the proposed development to provide alternative parking arrangements as the required parking provisions are accommodated wholly on the subject site. Moreover, the TIA prepared for the proposed development does not support reductions in minimum parking provisions. Further, dedicated sharing spaces equipped with electric vehicle charging provisions are not proposed as part of this application. As such, the development does not meet the acceptable outcomes to qualify for reduced parking provisions. Rooftop parking was also considered in the initial scoping exercise and was rendered unsuitable. The proposal exceeds the maximum height provisions in its current form. The inclusion of rooftop parking would result in excessive building height provisions which would not demonstrate compliance with Clause 4.6. Considering the length of vehicular ramps to a rooftop carpark also, to clear shopping centre ceiling heights, the proposal would be visually obtrusive and the associated costs in attempting both options would be excessive and

Port Stephens Request for Further Information - Ecology	AEP Response
	unsustainable. Similarly, as the development is wholly contained within the approved development zone and the site is constrained by Acid Sulphate Soils and heritage items, and high water-table levels (Fullerton Cove nearby), the provision of underground car parking spaces was rendered unsuitable for the site. TEC area within PCT 1717 (poor) and PCT 1737 (Moderate) totals 0.74ha or 11% of the total Study Area or 30% of the Subject Site that has been predominately cleared and underscrubbed and has been zoned as E1. HEV TEC further reduces this area to 0.277ha or 11.2% of Subject Site or 4% of Study Area being impacted. The principals of avoid and minimise within the Subject Site have been considered, whereby the site fundamentally lacks ecosystem regeneration and connectivity, however proactively creating nature positive outcomes and results that will improve biodiversity values over time from its current state through proposing the following works; - Landscape Plan utilising native endemic species; - Residual land within the Study Area be placed under a Biodiversity Management Plan - Enhancement of flora and fauna habitat within the C2 lands, improving the condition ensuring an improved future vegetation integrity score; - Environmentally-friendly lighting design that avoids light-spill into surrounding areas of native vegetation; - Water quality and quantity treatment devices designed to ensure an improvement; - Fencing where relevant, to reduce the likelihood of edge effects and prevent fauna incursions in active commercial land. - Avoid and minimise principles were considered through the planning stage of the proposed development as well as the location within the wider lot. The location of the land to service the requirements of residential development in Fullerton Cove that has been zoned appropriately (E1) with residual C2 lands, therefore, the proposal is considered a suitable position for the Subject Site. The thorough investigation and design iterations during the Planning Proposal ensured the principles of avoid and minimise by utilising the lower quality cleared land that continues to be managed whilst the area containing higher quality vegetation of biodiversity value will be retained, illustrating that the development is located within the most suitable, disturbed part of the site. Furthermore, the preparation of a Biodiversity Management Plan for the C2 land, implementation of the principles of water sensitive urban design and landscaping within the Subject Site will contribute to the minimisation of impacts throughout. Overall, the impact area has moderate to high levels of degradation, with high weed loads and presence of high-threat exotics (HTE). Clusters of moderate quality native vegetation border three sides of the Subject Site, and connect into adjacent lots. Creating a nature positive outcome on a site that has minimal biodiversity value across the majority of the site has been part of a reiterative process. If the Subject Site was not developed, weeds and exotic species would

Port Stephens Request for Further Information - Ecology	AEP Response
	become more dominant and VIS's would continue to decline, but with the BMP and stormwater management plan the vegetation and water within the area will significantly improve. This proactive approach presents a nature positive outcome for all local flora and fauna species present, and provides greater protection for the RAMSAR Wetlands.
7. The development (as currently proposed) will impact an area of LEP mapped wetlands (please refer to Figure 1 above). In accordance with Section 7.9 of the Port Stephens LEP, further justification is required detailing why impacts to this area cannot be reasonably avoided. ***7.9 Wetlands*** *(1) The objective of this clause is to ensure that wetlands are preserved and protected from the impacts of development.* *(2) This clause applies to land identified as "Wetland" on the Wetlands Map.* *(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider—* *(a) whether or not the development is likely to have any significant adverse impact on the following—* *(i) the condition and significance of the existing native fauna and flora on the land,* *(ii) the provision and quality of habitats on the land for indigenous and migratory species,* *(iii) the surface and groundwater characteristics of the land, including water quality, natural water flows and salinity, and* *(b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.* *(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—* *(a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or* *(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or* *(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.*	The Study Area covers approx. 6.86ha and the Subject Site zoned Local Centre (E1) totals approx. 2.46ha, with the remainder of the land zoned Environmental Conservation (C2) totalling approx. 4.40ha. The current proposal involves the clearing of a small percentage of the mapped wetlands occurring on site. The proposal avoids the majority of this mapped wetland area (see below) within the Study Area with only a small area of the EEC (11% or 0.74ha of total Area), in poor and moderate condition, proposed for removal. This area has been approved for rezoning within the E1 zone. The remainder of the Subject Site consists of predominately of PCT 1717 with also wetland TEC PCT's of 1737 & 1728 being retained and enhanced under a BMP totalling an area of 4.40ha. Further protecting and enhancing this mapped wetland area under a BMP is a nature positive outcome which is far better than doing nothing and continuing as is.  **LEP Wetlands mapping** The proposed development has been positioned primarily within the unmapped wetland areas of the Study Area with 4.24ha zoned as C2- Environmental Conservation. The Study Area (including parts of the Subject Site) contain small patches of wetland complex and areas of forested wetlands which are periodically inundated. Majority of the Subject Site has historically been cleared of native vegetation and managed regularly. Alterations to the topography of the site has likely resulted in changes to the hydrological regime which have likely affected these areas of forested wetlands and wetland complex. Impacts to Freshwater Wetlands EEC will be limited to 0.27ha within land when rezoning occurred to *E1: Local Centre* (Subject Site). A total of 0.22ha will be retained as part of the proposed rezoning of land from *RU2: Rural Landscape* to C2*: Environmental Conservation*. Additionally, the rezoning of land from *RU2: Rural Landscape* to C2*: Environmental Conservation*, good condition vegetation (PCT 1717) likely commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and*

<table>
<tr><th>Port Stephens Request for Further Information - Ecology</th><th>AEP Response</th></tr>
<tr><td></td><td>South East Corner Bioregions, will be retained. Retained vegetation containing good structural complexity, especially moderate condition PCT 1717 and moderate condition PCT 1646, likely provides suitable foraging and potential roosting habitat for the Powerful Owl (Ninox strenua) a threatened species detected outside of the Development Site during surveys. Given the proximity of the proposed development to the Hunter Estuary Wetlands, A Storm Water Management Plan will be prepared for the proposed development. Therefore, it has been determined that the biodiversity within the Study Area will significantly improve and be protected with the implementation of a BMP on the retained land. This is a nature positive approach in enhancing and protecting the area. Should the Subject Site not be developed, an increase in exotic weeds is expected.</td></tr>
<tr><td>8. Within the landscape plan there are 5 trees identified for removal along the eastern boundary that are either on the border of the conservation zone boundary or within the conservation zone area. It is currently unclear whether one of these trees is a hollow bearing tree as identified in the BDAR. Removal of these trees is inconsistent with the C2 zone objectives of the LEP and impacts have not been assessed under the BDAR. Impacts to the two northernmost trees appears to be avoidable without design changes. However, amendments to the design may be required to avoid impacts to the other three trees. An arborist report should be provided to demonstrate that impacts will not result in the damage or death of these trees.</td><td>An Arborist Impact Assessment has been conducted and an additional impact area of 0.0172ha to PCT 1646 will need to be included with 5 trees encroaching the Subject Site within the BDAR and no previously mapped HBT’s will be impacted.

Arborist Impact Assessment Report has been provided; in summary –

<table>
<tr><th rowspan="2">Tree Assessment</th><th colspan="3">Retention Value (Tree No)</th><th rowspan="2">Total</th></tr>
<tr><th>High</th><th>Moderate</th><th>Low</th></tr>
<tr><td>Remove (TPZ/SRZ Encroachment)</td><td></td><td>Trees 1, 4, 5,</td><td></td><td>3</td></tr>
<tr><td>Remove (Development Footprint)</td><td></td><td>Trees 3, 6</td><td></td><td>2</td></tr>
<tr><td>Total Tree Removal</td><td>0</td><td>5</td><td>0</td><td>5</td></tr>
<tr><td>Retain (Protection fencing)</td><td></td><td>Tree 2</td><td></td><td>1</td></tr>
<tr><td>Total Tree Retention</td><td>0</td><td>1</td><td>0</td><td>1</td></tr>
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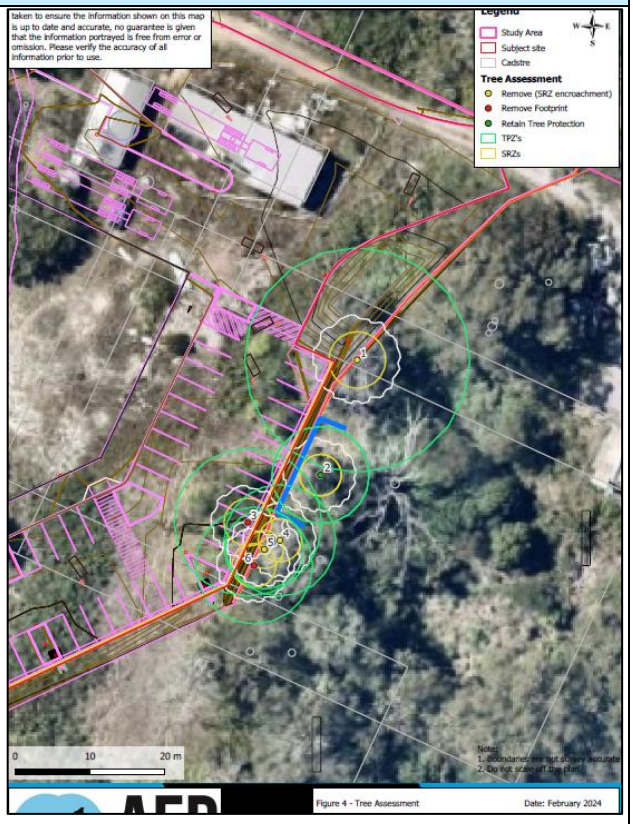
Port Stephens Request for Further Information - Ecology	AEP Response
	 **Location of the six (6) trees included in the AIA.** Efforts have been made to avoid impacts on the majority of trees present on site. Out of the fifteen (15) hollow-bearing trees located within the Study Area, all fifteen (15) trees have been retained, thus reflecting consistency with the C2 zone objectives of the LEP. Trees of high habitat value have been retained and those of lower value have been proposed for removal.
9. The BDAR states that "permanent lighting shall be designed to minimise light spill into surrounding vegetation." Please provide a detailed lighting plan that demonstrates fauna conscious lighting design. The lighting plan should be consistent with the objectives and design principles detailed in the 'National Light Pollution Guidelines for Wildlife' (DCCEEW 2023).	AEP can include the lighting plan in the BDAR Appendix now that it has been provided: *Northrop Electrical Report 42 Fullerton Cove Road, Fullerton Cove 21 Mar 2024* summarises the following: Best practice lighting design principles to reduce light pollution: • Start with natural darkness and only add light for specific purposes. • Use adaptive light controls to manage light timing, intensity and colour. • Light only the object or area intended – keep lights close to the ground, directed, and shielded to avoid light spill. • Use the lowest intensity lighting appropriate for the task. • Use non-reflective, dark-coloured surfaces.

Port Stephens Request for Further Information - Ecology	AEP Response
	• Use lights with reduced or filtered blue, violet and ultraviolet wavelengths Please refer to Northrop report for further details which will also include the Business Signage within the C2 lands.

Table 1 Threatened Frog BioNet Records

Species	NSW Status	Commonwealth Status	BioNet Records			Species Detected During Surveys	Suitable Habitat within the Study Area		Survey Timing		
			Total	Closest Proximity	Most Recent		Breeding	Non-Breeding	Survey Period in accordance with the BAM-C	Month Survey was Undertaken	
										Kleinfelder	AEP
Green and Golden Bell Frog *Litoria aurea*	E	V	14	2011 1.9km south	2020 4.1km south-west	N	N	Y	November - March	October, December	February
Green-Thighed Frog *Litoria brevipalmata*	E	-	0	N/A	N/A	N	N	N	September - April	October, December	February
Mahony's Toadlet *Uperoleia mahonyi*	E	E	15	2021 1.5km south	2022 3.1km east	N	N	N	October - March	October, December	February
Wallum Froglet *Crinia tinnula*	V	-	25	2022 1.2km south-west	2022 1.2km south-west	N	N	N	All year	October, December	February

Table 2 Survey Documentation

Date	Timing									Method	Effort	Critical Habitat Features	Identification
	Temperatures (°C)		Rainfall (mm)			Humidity (%)	Barometric Pressure	Wind	Cloud Cover	Moon Phase				
	Min	Max	Previous 24 hours	7 Days	Month								
26/10/2020	13.7	16.8	128.8	42.4	252.0	100	1014	50 SSE	7/8	Waxing Gibbous	Aural-visual surveys	GPS recording of qualified surveyor's	No waterbodies present on site, Surrounding water brackish	Peron's Tree Frog (*Litoria peronii*) – OW Green Tree Frog (*Litoria caerulea*) - W
16/12/2020	21.3	29.9	14.8	6.4	156.2	74	-	31 NE	-	Waxing Crescent	Aural-visual surveys	GPS recording of qualified surveyor's	No waterbodies present on site, Surrounding water brackish	Eastern Dwarf Tree Frog (*Litoria fallax*) – W Peron's Tree Frog (*Litoria peronii*) – W Tyler's Tree Frog (*Litoria tyleri*) - W
21/12/2021	21.9	30.6	0.2	2.6	20.4	71	-	20 SE	-	Waning Gibbous	Aural-visual surveys	GPS recording of qualified surveyor's		-
23/12/2021	22.4	-	0	2.8	20.4	84	-	ENE 13	-	Waning Gibbous	Aural-visual surveys	GPS recording of qualified surveyor's	As above	-
22/02/2023	19.8	21.2	45.6	3.2	107.4	93	1022	28 SE	8	Waxing Crescent	Aural-visual surveys	GPS recording of qualified surveyor's	No waterbodies present on site, Surrounding brackish water	Common Eastern Froglet (*Crinia signifera*) – O, W
23/02/2023	18.3	24.6	35	47.8	107.4	74	1024	19 ESE	8	Waxing Crescent	Aural-visual surveys	GPS recording of qualified surveyor's	As above	Common Eastern Froglet (*Crinia signifera*) – O, W

Key: O = Observed, W = Heard

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We note that no amendments have been made to the BDAR that was submitted within the BAM-C until the RFI matters have been adequately addressed and the BAM-C can be reopened to upload V2.

We thank you for the opportunity to be involved in this project. Should you require any further clarification on this matter, please contact Natalie Black (Senior Environmental Manager- 0431 249 360) or myself.

Regards

Anderson Environment & Planning

Kelly Drysdale

Ecology Project Manager

0428 296 470

Attachments:

Appendix A: BCD HEV Criteria

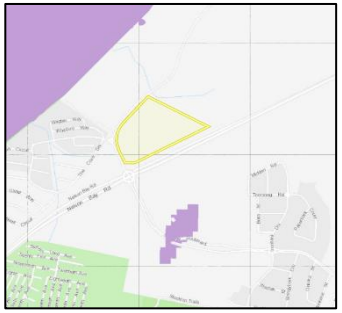
Annexure A: Sites of geological significance included in the State Heritage Register or Heritage Inventory

Appendix B: Warwick Muir updated resume as example if required.

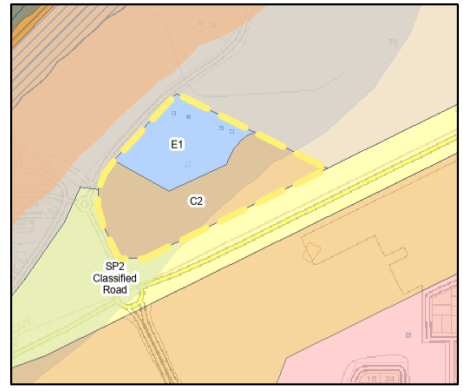
Appendix C: Amended BDAR Figures 8 & 11

Appendix D: Design iterations

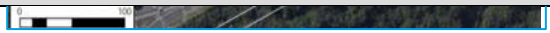
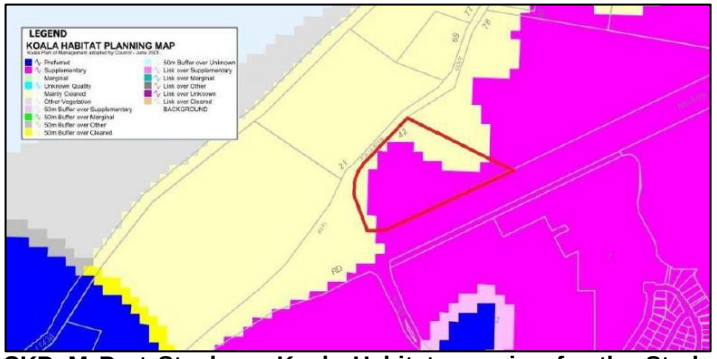
Appendix A - BCD HEV Criteria and Identification Methods at the Property Scale

High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
Criterion 1. Sensitive biodiversity mapped on the Biodiversity Values Map		
1.1 Biodiversity Values Map	a. Identify the parts of the land on the Biodiversity Values Map. b. Inspect those mapped areas on the land to verify accuracy and map as HEV where the map is accurate.	None of the Study Area or Subject Site is BV mapped land and not a HEV.  **BV Mapping of Study Area**
Criterion 2. Native vegetation of high conservation value		
2.1 Over-cleared vegetation types	a. Identify Plant Community Types (PCTs) on the land through field work. b. Register and visit the Vegetation Information System (VIS) database. c. Use the VIS to determine whether the % cleared status of the PCTs identified through field work on the land is above 70%. d. Map all PCTs on the land with the % cleared above 70% as HEV.	PCT 1646 – *Smooth-barked Apple – Blackbutt- Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – 45% cleared, therefore not a HEV. PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* – 68% cleared, therefore not a HEV. PCT 1737 – *Typha Rushland*– 70% cleared, therefore not a HEV. PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* – 81% cleared, therefore **is a HEV.** Refer to Ground truthed vegetation **Figure 12** whereby 0.007ha of high conservation value will be impacted within PCT 1728.

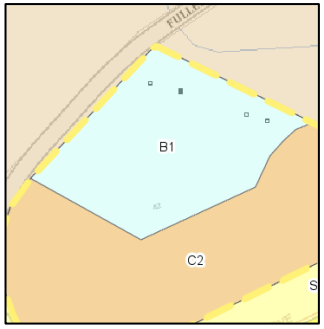
High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
2.2 Vegetation in over-cleared landscapes (Mitchell landscapes)	a. Identify over-cleared Mitchell landscapes by viewing map data from the SEED Portal – selecting NSW (Mitchell Landscapes) – latest version, selecting Show on Seed Map and viewing the View Over Cleared Land Status. b. Map all native vegetation on the land as HEV if it is in an over-cleared Mitchell landscape.	Threshold for over-cleared is greater than 0.7 Mapped as Sydney - Newcastle Barriers and Beaches landscape. Estimate fraction cleared: 0.5 therefore not over-cleared and Not HEV.  **Mitchell Landscape distribution for the site ex SEED**
2.3 Threatened Ecological Communities - any vulnerable, endangered, or critically endangered ecological community listed under the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* or the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* and not mapped on the Biodiversity Values Map	a. Identify Plant Community Types (PCTs) on the land through field work. b. Register and visit the VIS database. c. Use the VIS to determine whether the PCTs on the land have Threatened Ecological Community (TEC) Status. d. If not *identified* as a TEC from steps a – c above, then refer to the NSW Threatened Species Scientific Committee determinations, schedules 4, 4A and 5 of the FM Act, and the EPBC Protected Matters Search Tool to consider whether the any of the PCTs accord with the determinations. a. Map all PCTs on the land that are TECs as HEV.	This requires all listed TECs within the region or study area to be listed, and then mapped. An assessment of condition may be appropriate, dependent on the TEC identified, and areas not in moderate-good condition or highly disturbed may be excluded from the mapping. PCT 1646 – *Smooth-barked Apple – Blackbutt- Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – no associated TEC, therefore not a HEV. PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* – was considered to be commensurate with the State listed TEC; Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and is also considered be commensurate with EPBC listed TEC; Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland for the 0.46ha in poor condition, VIS of 35.5 therefore not a HEV under this HEV assessment although has been included in BDAR and BAMC as a TEC. PCT 1737 – *Typha Rushland– This community forms part of the Endangered Ecological Community* (EEC) Freshwater wetlands on coastal floodplains of the NSW North Coast/Sydney Basin and South East corner bioregions for 0.27ha in moderate condition,

High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
		therefore is a HEV. PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast*– This community forms part of the Endangered Ecological Community (EEC) Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin, and South East Corner Bioregions for 0.007ha in moderate condition, **therefore is a HEV.** Of the 6.86ha Study Area, 0.277ha of the 2.46ha Subject Site are TEC's and therefore considered HEV. This is equivalent to 11.2% of the Subject Site and 4% of the Study Area being impacted, **Refer Figure 4** in BDAR for ground truthed vegetation
2.4 100m buffer on Coastal Wetlands and Littoral Rainforest areas as per the State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021	a. Locate the land on the SEPP (Resilience and Hazards) Maps b. Map any parts of the land shown as proximity areas for Coastal Wetlands and Littoral Rainforest as HEV.	No parts of the Study Area fall within the Proximity to Coastal Wetlands and Littoral Rainforest Area, or Coastal Use Area but does fall within the Coastal Environment Area Mapping according to the SEPP Coastal Management (2018) as shown on the SEPP Resilience and Hazards 2021 Land Application Map. Not mapped as proximity area, therefore not a HEV.  **Coastal Environment Area Map over Subject Site Ex NSW Planning Portal Spatial Viewer** Refer **Appendix G** of BDAR under State Environmental Planning Policy (Resilience and Hazards) 2021

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method	Project Comment
Criterion 3. Threatened species			
3.1 Key habitat for threatened species (vulnerable, endangered, or critically endangered species listed under BC Act)	Key breeding habitats with known breeding occurrence	a. Search BioNet for threatened species records on and within 5km of the land b. Undertake field work to identify potential breeding habitats on the land for threatened species. c. Either assume breeding occurrence and map identified breeding habitats on the land as HEV or undertake targeted surveys during the breeding season and map theses habitats as HEV if breeding occurs there.	A 5km BioNet record search was undertaken and a 1500m buffer mapped and shown in **Figure 5**. Fieldwork has been completed for targeted surveys for threatened species known to be present or predicted to occur within the Study Area. Threatened flora species survey effort is shown in **Figure 7** and threatened fauna species survey effort is shown in **Figure 8**. The location of threatened species records observed on site or known from BioNet records is shown in **Figure 5.** The relevant species polygons as per the Threatened Biodiversity Data Collection is shown in **Figure 10 for** Southern Myotis and assumed presence polygon **Figure 11** for Common Planigale. Key breeding habitats with known breeding occurrence was not confirmed, only assumed, therefore, it has to be **considered a HEV.** Common Planigale shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. Southern Myotis generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage. Within the mapped areas (as indicated below) of PCT 1737 & 1717, its highly unlikely that key breeding for either of this species would occur.

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method	Project Comment
			 **PSC HBV/HEV mapping query**
	Core Koala Habitat	a. Check council records for approved comprehensive or individual property Koala Plans of Management (KPoM). b. Identify areas of core koala habitat on the land mapped in any approved KPoM and map these areas as HEV. c. If there are no approved KPoMs, then undertake field work in accordance with the relevant State Environmental Planning Policy (SEPP) for koalas, e.g. SEPP (Koala Habitat Protection) 2020, to determine whether Core Koala Habitat is present on the land. d. Map any core koala habitat identified on the land through field work as HEV.	A mapped under Port Stephens Comprehensive Koala Plan of Management (PSCKPoM). The assessment in accordance with both the EPBC Act and PSCKPoM showed that the site does not contain core koala habitat as there are no areas of Preferred Koala Habitat or defined Habitat Buffers are mapped within the Subject Site or within the Study Area. Fieldwork completed also confirmed this and the site does not meet the definition of Core Koala Habitat as per Koala Habitat Protection 2020., therefore <u>not a HEV</u>.  **CKPoM Port Stephens Koala Habitat mapping for the Study Area indicating 'Supplementary Koala Habitat' & 'Mainly cleared land** **Refer Appendix G** of the BDAR under State Environmental Planning Policy (Biodiversity and Conservation) which includes 2021 Port Stephens Comprehensive Koala Plan of Management Assessment

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method	Project Comment
	Habitat for known populations of species-credit-species and SAII entities (species-credit species and SAII entities are identified in the Threatened Biodiversity Data Collection)	a. Search BioNet for threatened species records on and within 5km of the land. b. Undertake field work to identify populations of threatened species credit species on the land and their habitats. c. Map all habitats of known populations of species credit species on the land as HEV. The Biodiversity Assessment Method and the Department's survey assessment guidelines should be referred to for suitable habitat assessment methodologies. If a recent Biodiversity Development Assessment Report has been prepared for the land, then this could be referred to in support of demonstrating how this criterion has been considered.	A Biodiversity Development Assessment Report has been undertaken for the Subject Site. A 5km BioNet record search was undertaken and a 1500m buffer mapped and shown in **Figure 5.** Fieldwork has been completed for targeted surveys for threatened species known to be present or predicted to occur within the Study Area and a BDAR. Threatened flora species survey effort is shown in **Figure 7** and threatened fauna species survey effort is shown in **Figure 8**. The relevant species polygons as per the Threatened Biodiversity Data Collection is shown in **Figure 10 for** Southern Myotis and assumed presence polygon **Figure 11** for Common Planigale for species-credit-species but there are no SAII species. HEV species polygons are shown in **Figures 10 & 11.**
	Key habitats for migratory species	a. Search BioNet for threatened migratory species records on and within 5km of the land. b. Undertake field work to identify habitats of threatened migratory species on the land. c. Map all habitats of threatened migratory species on the land as HEV.	No suitable habitat for migratory shorebirds and the site is not Important Areas mapped for such. The site does not provide any habitat of note for migratory species and a HEV layer is not appropriate.
Criterion 4. Wetlands, rivers, estuaries & coastal features of high environmental value			
4.1 Nationally important wetlands Note: Rivers and their riparian areas comprising HEV are included in the Biodiversity Values Map under HEV Criterion 1 as protected riparian land		a. Search the Directory of Important Wetlands in Australia for those occurring in NSW. b. Identify any nationally important wetlands listed in the directory that occur on the land and map these areas as HEV.	Subject Site is not BV Mapped and not listed as a Nationally Important Wetland however site is located within the Hunter catchment. The Hunter Estuary Wetlands Ramsar site is listed in the Directory of Important Wetlands in Australia. Within the BDAR it is noted that are no artificial dams or mapped hydrolines recorded within the Study Area. One (1) unnamed first order mapped hydroline is located approx. 3m north of the Subject Site that then runs into Fullerton Cove. Approx. 275m west of the Subject Site lays the Hunter Wetlands National Park. Site investigations indicate that the closest top of bank stream measurement **is within** 3m of the Subject Site and as such there will be VRZ encroachment within the Subject Site and a Controlled Activity Approval (CAA) will be required to be submitted with the Development Application as per the *Water Management Act*. The site does not contain Nationally Important wetlands and a HEV layer is not appropriate.

High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
4.2 Vulnerable Estuaries and Intermittently Opening and Closing Lakes and Lagoons (ICOLLs)	a. Identify whether any vulnerable estuaries or ICOLLs occur on, or in the vicinity of, the land by reviewing the Maps. b. Map any vulnerable estuaries or ICOLLs that occur on, or in the vicinity of, the land as HEV.	The site not an estuary or an ICOLL and a HEV layer is not appropriate.
Criterion 5. Areas of geological significance		
5.1 Karst landscapes	a. Identify whether limestone outcrops or caves occur on the land. b. Consider any additional Karst landscapes that occur in the vicinity of the land, with reference to the NSW Government's Guide to New South Wales Karst and Caves and any other available karst mapping, such as karts maps associated with local environmental plans. c. Map any limestone outcrops or caves on the land and any other karst landscapes that occur in the vicinity of the land as HEV.	No limestone outcrops or caves occur in or proximate to the Study Area and a HEV layer is not appropriate.
5.2 Sites of geological significance included in the State Heritage Register or Heritage Inventory	a. Identify whether the land contains, or is in the vicinity of, the sites of geological significance listed in Annexure A. b. Map any sites of geological significance that occur on, or in the vicinity of, the land as HEV.	The Study Area is not included on the State Heritage Register or Registry Inventory for geological significance (refer **Annexure A** below) and a HEV layer is not appropriate.  **Aboriginal Cultural Significance Map (Ex ePlanning Spatial Viewer) and current known areas as investigated**

Annexure A: Sites of geological significance included in the State Heritage Register or Heritage Inventory

Local Government Area	Name	Location
Canterbury Bankstown	Enfield Brickpits	7 Juno Parade, Greenacre
Cessnock	Bow Wow Creek Gorge	Sandy Creek Road, Mulbring
Eurobodalla	Myrtle Beach - Wasp Head Coastal Area	Durras
	Melville Point	Red Hill Road, Tomakin
Goulburn-Mulwaree	Badgerys Lookout View	Tallong
Kiama	Bombo Headland Quarry Geological Site	Princes Highway, Bombo
Port Stephens	Seaham Quarry	Torrence Street, Seaham
Shellharbour	Bass Point Area	Bass Point Tourist Road, Shellharbour
Warrumbungle	Narangarie Quarry Geological Site	Narangarie Road, Coolah
Uralla	The Captain Thunderbolt Sites – Thunderbolt's Rock	New England Highway, Uralla

WARWICK MUIR
Senior Ecologist

0448 689 698 | warwick@andersonep.com.au | Newcastle NSW

ACADEMIC QUALIFICATIONS

- Bachelor of Science (Biology) – University of Newcastle, 2019
- Diploma of Arboriculture (AQF5), 2021
- International Society of Arboriculture (ISA) Tree Risk Assessment Qualification (TRAQ)

TRAINING & LICENCES

- NSW Class C Driver's Licence
- Provide First Aid HLTAID011
- NSW Construction White Card
- Level 1 Tree Access Systems certified

FIELDS OF COMPETANCE

- Tree Field Data Collection using Tree Visual Assessment methodology including species name, common name, Structure and Health condition, SULE, TPZ, SRZ, Landscape Significance, Retention Value and general notes as required for small and large - scale projects
- Tree stock and planting inspections for ecological rehabilitation works
- Construction supervision, certification and long-term Tree monitoring
- Preparation of Arboricultural Impact Assessment(s) and Tree Protection Plans as per AS4970:2009 for small and large – scale projects
- Tree Hazard assessments using ISA TRAQ assessment methodology
- Tree pruning specifications as per AS 4373 Pruning Amenity Trees, management and maintenance programs
- Tree root mapping
- 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

Frog Survey experience

- Newcastle University field excursion to Ash Island on the Hunter Estuary, assessing the aquatic habitat for the Green and Golden Bell Frog.
- Nocturnal survey throughout Newcastle Golf Course, looking for threatened frog species..
- 2055 Halloran GTF, GG, MF, WF
- 1910 Mardi Services GTF, GG, MF, WF
- 1973 Eden Estates, 20 hours (At least 10 different visits) – . GTF, GG, MF, WF (same species as Fullerton Cove). At least once each with experienced seniors; Natalie Black, Simon Purcell and Ian Benson.
- Bundanoon
- Multiple Jensen/ Johns Rd Jobs GTF, GG, MF,
- 3302 Teralba GTF, GG, MF, WF
- 1898 Wallabi Pt MF, WF

- 2207 Pheasants nest
- 2208 Eastern Creek
- 2274 Wyee Wonderland GTF , MF, WF
- 2390 Anna Bay

PROFESSIONAL EXPERIENCE

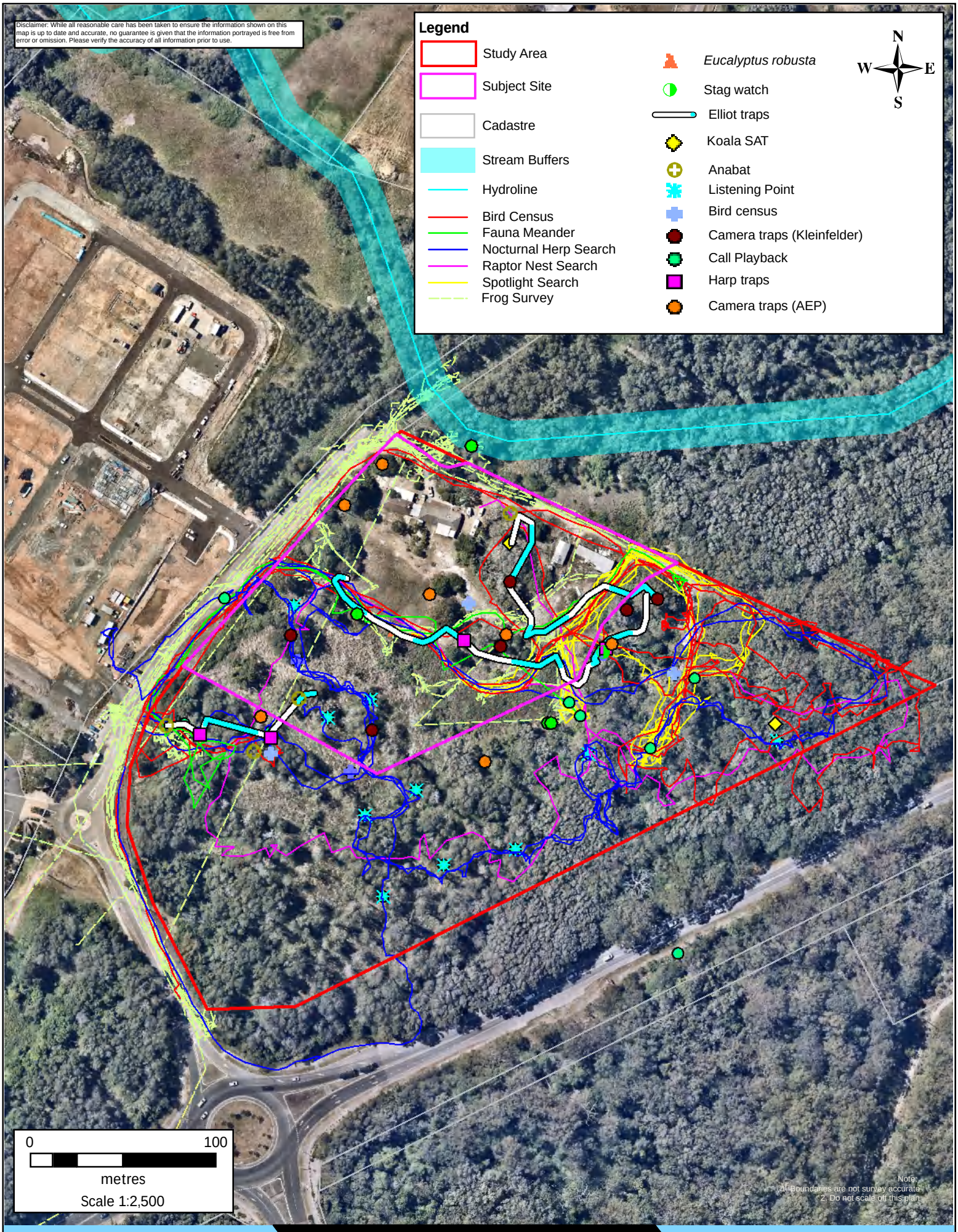
Ecologist/ Arborist (AQF5) 2020 – Present
Anderson Environment & Planning
Newcastle NSW

ECOLOGICAL EXPERIENCE

- Bush Regeneration Volunteer

Newcastle Landcare

- Field data collection for environmental Honours and PHD candidates in various locations



AEP

Figure 8 - Fauna survey effort

Date: February 2024

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS Ref: 36338

Client: Monteath and Powys

AEP Ref: 3063

AEP

Figure 11 - Common Planigale areas

Date: Feb 2024

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS: 36338

Client: Monteath and Powys

AEP Ref: 3063

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
7,957m²

LETTABLE / NET FLOOR AREA (NFA)
RETAIL 01-04 + MALL + LIQUOR + SUPERMARKET
= 7,528m²

CAR PARKING
280 x PUBLIC SPACES
6 x ACCESSIBLE SPACES
67 x STAFF SPACES
TOTAL = 353 SPACES

CONCEPT DESIGN

N

SITE PLAN
1:500 @ A1

14311 - SK - A02 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

CONCEPT DESIGN

N

GROUND FLOOR PLAN

1:200 @ A1

14311 - SK - A03 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
7,693m²

LETTABLE / NET FLOOR AREA (NFA)
RETAIL 01-04 + MALL + LIQUOR + SUPERMARKET
= 7,199m²

CAR PARKING
279 x PUBLIC SPACES
6 x ACCESSIBLE SPACES
67 x STAFF SPACES
TOTAL = 352 SPACES

BOUNDARY
SERVICE ENTRY
STAFF PARKING 67 SPACES
TRUCK MANOEUVERING AREA
24m BUSHFIRE APZ
TROLLEY STORE
LOADING DOCK
DIRECT TO BOOT
B1-E2 LAND ZONE BOUNDARY
PROPOSED RETAIL DEVELVOPMENT
BFA = 7,693 m²
BOUNDARY
TROLLEY BAYS
CROSSING
ENTRY
EXIT
FORECOURT
FULLERTON COVE ROAD
CARPARK
285 SPACES
24m BUSHFIRE APZ
B1-E2 LAND ZONE BOUNDARY
BOUNDARY

CONCEPT DESIGN

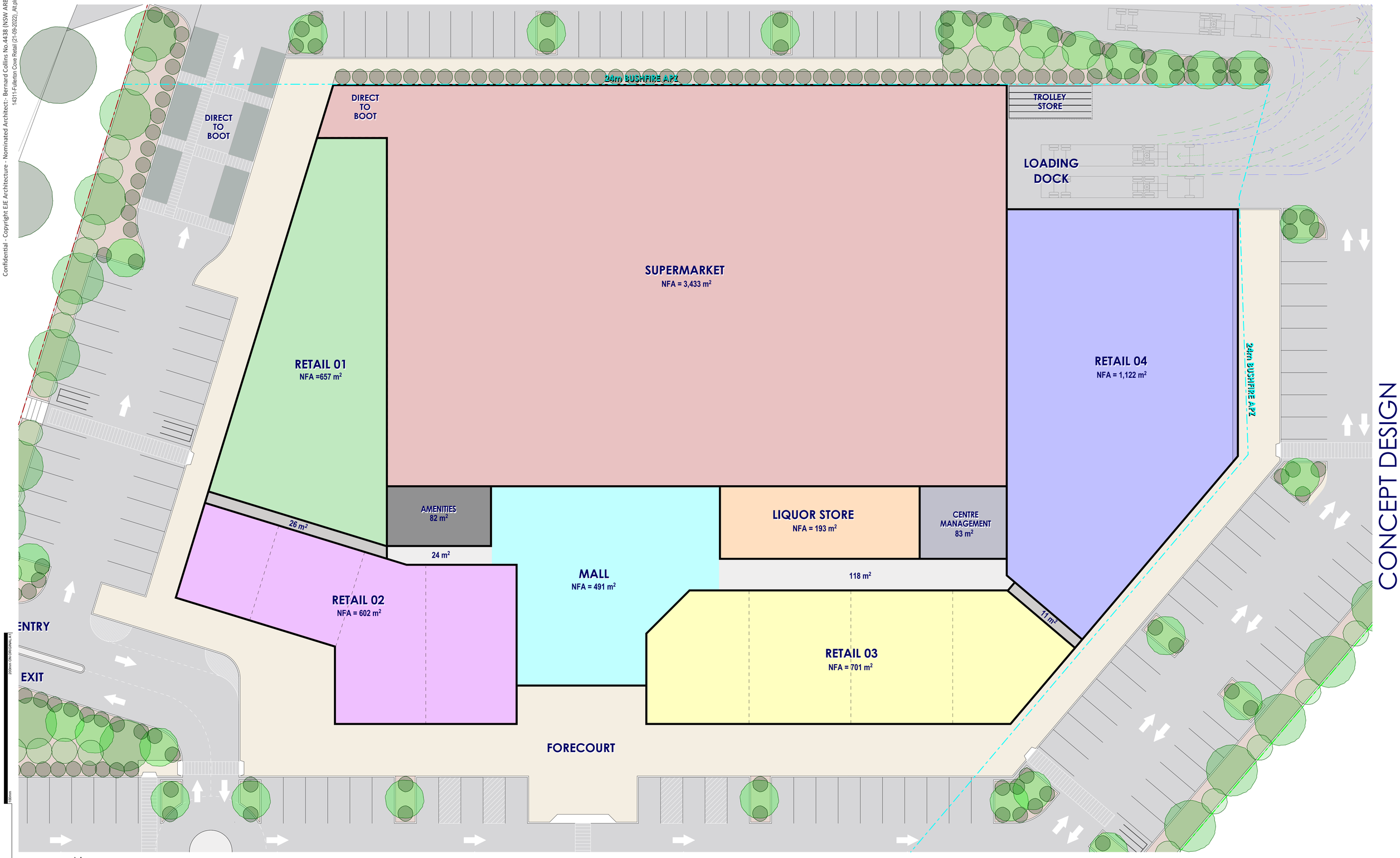
N

SITE PLAN
1:500 @ A1

14311 - SK - A02 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT
42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture



GROUND FLOOR PLAN

1:200 @ A1

CONCEPT DESIGN

14311 - SK - A03 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
7,968m²

LETTABLE / NET FLOOR AREA (NFA)
RETAIL 01-04 + MALL + LIQUOR + SUPERMARKET
= 7,472m²

CAR PARKING
279 x PUBLIC SPACES
6 x ACCESSIBLE SPACES
67 x STAFF SPACES
TOTAL = 352 SPACES

CONCEPT DESIGN

N

SITE PLAN
1:500 @ A1

14311 - SK - A02 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

24m BUSHFIRE APZ

DIRECT TO BOOT

DIRECT TO BOOT

TROLLEY STORE

LOADING DOCK

SUPERMARKET
NFA = 3,433 m²

RETAIL 01
NFA =657 m²

RETAIL 04
NFA = 1,122 m²

24m BUSHFIRE APZ

AMENITIES
82 m²

LIQUOR STORE
NFA = 193 m²

CENTRE MANAGEMENT
83 m²

26 m²

24 m²

118 m²

11 m²

MALL
NFA = 521 m²

RETAIL 02
NFA = 719 m²

RETAIL 03
NFA = 827 m²

ENTRY

EXIT

FORECOURT
1,559 m²

CONCEPT DESIGN

N

GROUND FLOOR PLAN

1:200 @ A1

14311 - SK - A03 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

BIODIVERSITY | BUSHFIRE | ARBORICULTURE

NEWCASTLE SYDNEY

Our Ref: **3063.03**

Date: **27 June 2024**

To **Monteath & Powys**

ATTN: **Jamie Graham**

Via Email **J.Graham@monteathpowys.com.au**

Dear Jamie,

RE: Final RFI to DA 16-2023-685-1 at 42 Fullerton Cove Road Fullerton Cove, NSW Lot 14 DP258848 as requested by Port Stephens Council

At the request of Monteath and Powys Ltd Pty, Anderson Environment & Planning (AEP) herewith provides three responses to address the Ecology portion of the above mentioned RFI's:

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
1. Please provide further details demonstrating that frog surveys (Wallum Froglet, Green and Golden Bell Frog, Green-thighed Frog and Mahony's Toadlet) have met the requirements of the 'NSW Survey Guide for Threatened Frogs', or frog surveys will need to be redone in accordance with the requirements of the 'NSW Survey Guide for Threatened Frogs'. Please note that the survey period for all candidate frog species is available until the end of March. In accordance with the 'NSW Survey Guide for Threatened Frogs': i. Frog surveys must be undertaken by an ecologist with demonstrated experience and skills in frog survey as detailed in Section 2.2 of the 'NSW	i. In accordance with Section 2.2 of the "NSW Survey Guide for Threatened Frogs', three (3) Ecologists from AEP as well as three (3) Ecologists from Kleinfelder undertook amphibian surveys within the Study Area. The AEP survey team was led by Warwick Muir (Bsc (Biology); DipArb (AQF5)) and assisted by Matt Booker (B.Env Sc & Mgmt) and Kelly Drysdale (Ass.Dip. App Sc, Grad Cert BA, TAE). Mr. Muir has four (4) years' experience working as a qualified ecologist at AEP, with suitable experience performing threatened frog surveys (refer **Attachment B** updated resume). Ms. Drysdale	**Frog surveys** Compliance with survey guidelines has not been demonstrated for the reasons outlined below: Frog surveys for Wallum Froglet, Mahonys Toadlet and Green and Golden Bell Frog require a **total survey effort of 480 minutes on site**. Green-thighed Frog requires 240 minutes of total survey effort. Time spent on site was never reported in the Kleinfelder BDAR and AEP have reported 135 minutes of survey effort. Surveys conducted by AEP did not follow the standard 500m transect methodology. There is no hydrological data presented in the BDAR or supplementary information to substantiate claims of salinity and acidity reported by AEP. Frog survey guidelines require	**AEP has conducted sufficient habitat assessment and survey for amphibians**. It is noted that *'Frog surveys for Wallum Froglet, Mahony's Toadlet and Green and Golden Bell Frog require a total survey effort of 480 minutes on site*' as total effort for a 500m transect. **AEP total survey effort** of two people over two nights for nocturnal survey = 4.5hrs = 270 mins as referenced in AEP BDAR Table 15 p 61 & Table 18. Survey guidelines: 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. Total effort for a 500m transect (section of the riparian area as only potentially suitable habitat for frogs, that is	**PSC attended site 6&10/5/2024 to undertake frog survey.** A record of briefing – Hunter and Central Coast Regional Planning Panel held 29/5/24 was provided outlining: *Council overview of Ecology:* - *Site rezoning – rezoned in 2022 and a BDAR prepared to support and inform this process.* - *- Frog Surveys – 4 candidate species. Council have undertaken observations and undertaken water sampling. On balance Council is now satisfied with this element.*

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Survey Guide for Threatened Frogs'. ii. It is expected that frog surveys be undertaken nocturnally i.e. after last light. iii. Frog survey methods must follow methodologies outlined in Section 2 of the 'NSW Survey Guide for Threatened Frogs'. iv. Surveys must meet species specific requirements i.e. minutes spent on site (please refer to Section 2.8) and rainfall conditions as specified by the 'NSW Survey Guide for Threatened Frogs'. v. The BDAR must document the survey effort in accordance with Section 2.11 of the 'NSW Survey Guide for Threatened Frogs'.	and Mr. Booker have experience in frog surveys, however due to drought and site conditions have not personally identified the Fullerton Cove targeted threatened species in the field however all resumes have been updated to reflect relevant experience in survey methods (e.g. aural/visual surveys, call playback, dip netting, acoustic recorders) and demonstrated success in threatened frog identification in NSW. Additionally, all staff at AEP are supported by a senior management team (over 35 years' experience in ecological surveys within the Port Stephens Local Government Area) that were available for consultation in regard to frog call and photo identification. Multiple teams were out over	that water quality parameters to be reported in the BDAR. □ AEP did not provide information on the level of flooding observed in the wetland areas of the site at the time of survey. Guidelines for Mahony's Toadlet require waterbodies to be at least 70% full prior to survey. Frog survey guidelines require that water level be reported in the BDAR. AEP reported that due to the lack of waterbodies (ephemeral or permanent) no frogs were heard nor observed within the Subject Site during the frog surveys undertaken by AEP. However, this claim is not accepted by Council as the site contains wetland vegetation that periodically floods and provides ephemeral waterbody habitat as evident in the NearMap imagery below. **Figure 1.** NearMap imagery showing the wetlands holding water	located off site is approx. 60m) is 480mins, repeated 4 times over 2 consecutive nights following 50ml of rain within a 48hr period. As per the *NSW Survey Guidelines for threatened Frogs 2020* "Where there is insufficient habitat to accommodate a 500 metre transect a pro-rata effort is to be applied with all available habitat being searched". 480mins/500m = 0.96mins/m X 60m transect of suitable habitat = **57.6mins total required on site for transects and a TOTAL 270mins was undertaken by AEP** within suitable conditions rain/time as previously discussed in March RFI. A transect is considered as survey within suitable habitat, so in essence the 60m within the Subject Site of suitable habitat consisting of standing water and waterfront land is calculated out as 57.6mins total. It is noted that suitable habitat may be located on adjoining land, however AEP did not have approval from the adjoining landowner to access their property to conduct surveys. Therefore, it is noted AEP conducted surveys of all suitable habitat within	- *- Tree removal in C2 land.* - *- Biodiversity Mitigation Hierarchy*. AEP confirmed that their water sampling pH was concurrent with PSC even after recent substantial rainfall events and water bodies within the Subject Site. PSC surveys undertaken in the daytime on the 6&10/5/2024 also confirmed that the only frog species detected was *Crinia signifera* . Also agreed that suitable habitat for Wallum Froglet was not on site and sufficient habitat and survey was undertaken by AEP. M&P confirmed that through design changes, there will be no tree removal in C2 lands which includes two Swamp Mahogany's and no need for additional credit with no impact area. AEP updated the Arborist Impact Report accordingly (Refer **Appendix H**)

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	those two nights when sufficient rainfall was received that were all briefed prior and all findings shared after. Additionally Ms Lucy Gill is also part of the AEP team as a frog specialist with qualifications: B Env Sc & Mgmt – Ecosystems and Biodiversity Major & B Env Sc & Mgmt (Hons). Lucy has gained valuable skills in a variety of environments, including chytridiomycosis processing and screening via qPCR, nest box monitoring, trapping and capture-mark-recapture methods. She has utilised bioacoustic software and hardware to identify the breeding phenology and activity of the endangered Northern and Southern Heath Frog, with publications of these findings coming in the near future. Majority of her professional experience to date has	 □ AEP did not survey the development footprint for frogs. The justification provided was that the area could not easily be traversed and was too thick, impenetrable and unsafe to enter when conforming to safe work practices. This does not align to Council's understanding of the area, particularly considering that Kleinfelder were able extensively survey this area of the site. If AEP is unable to enter this area due to safety concerns, it is recommended that a different consultant with appropriate safety measures be	land they had legal access to survey in accordance with the required guidelines. Additional coverage of the Subject Site and outside the Subject Site was conducted as AEP are thorough when assessing potential species. It should also be noted that on the 22/02/2023 AEP had a student on site during the surveys, increasing the survey effort. This effort and times have not been included within the BDAR due to the lack of detailed threatened frog survey experience, however AEP can provide an extra 90mins of GPS evidence (total **360mins survey effort**). There is no need for further consultation to be undertaken with Kleinfelder to ascertain the number of minutes spent on site for their frog surveys as AEP completed sufficient survey. Klienfelder – **Approved Report** stated **Green & Golden Bell frog:** *No suitable breeding habitat present within the Study Area. Density of Typha and lack of open water reduces habitat suitability for the species. Only 3 records of within the*	Avoid and Minimisation was discussed and PSC pleased with the northern buffer on the RAMSTAR wetland and saw the value in that including retainment of a listed species (*Syzygium paniculatum)* and the PSCKPoM Koala feed tree *Eucalyptus robusta*. The **avoidance** areas are demonstrated in blue and red in the below image and the **minimise** area in green. Incorporating the flood modelling requirements in the southern portion, this area will have excavation works and new plantings that will include grasses typical of groundwater feed system. Ground covers to max 200mm in height for APZ management but will also allow for suitable access for tree maintenance.

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	been within the research and conservation field specialising in amphibian conservation biology and herpetology - including ecological modelling, spatial analysis, dataset and specimens management, laboratory research, citizen-science based approaches, community engagement, grant applications, survey planning and logistics, animal technician duties and client engagement. Overall, the AEP team have well demonstrated experience and skills in frog survey as we do with all flora and fauna specialist areas in a broad team of 60+ employees. ii. Kleinfelder performed four (4) nights of amphibian surveys in which frogs were	engaged to survey the area correctly. Noting the above, the following is recommended: 1. Consultation be undertaken with Kleinfelder to ascertain the number of minutes spent on site for their frog surveys. 2. Conduct additional frog surveys where required. Please note the following survey timing parameters: a. Wallum Froglet – All year after flooding rains b. Green-thighed Frog – Spring – autumn after flooding rains c. Mahony's Toadlet – Oct. – March d. Green and golden bell frog – Nov. – March 3. Where additional surveys are required and cannot be conducted within a reasonable timeframe, species may be assumed present or a species expert report may be provided.	*5km locality in the last 10 years. Closest record is from 2011 and is greater than 2km in distance from the Development Site.* **Mahony's Toadlet:** *Potential suitable habitat within Study Area. Recent records are located north of Fullerton Cove.* ***Wallum froglet:*** *Potentially suitable habitat in paperbark areas within the Study Area. Low number of database records mostly situated north of Fullerton Cove.* ***Green-thighed Frog****:* Klienfelder made no mention of habitat for this species, however their report stated that *"No suitable breeding habitat within the Study' for Giant Burrowing Frog and Stuttering Frog".* ***Klienfelder survey effort for Wallum, G&G & Mahony's: 26/10/2020, 16/12/2020, 21/12/2021 and 23/12/2021*** ***Nocturnal spotlighting searches, stationary listening points.*** ***Green-thighed Frog: October 26th & December 16th Nocturnal***	 Common Planigale habitat assessment confirmed that credits applied to the whole site is not appropriate and original mapping of canopy area in lieu of not being able to survey or engage an expert report will apply. Final Design now included in design iterations Appendix D

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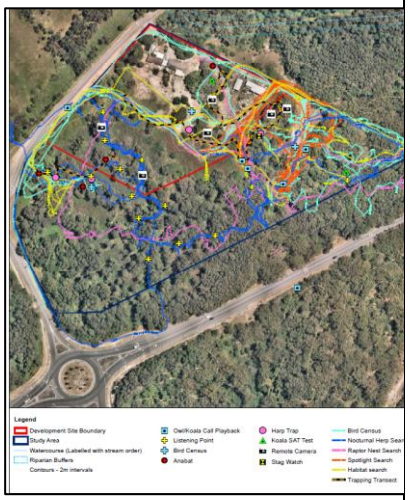
	identified by call and by spotlighting (inferring darkness), thus these surveys were undertaken after last light. AEP also performed two (2) nights of amphibian surveys in which amphibians were identified auditorily and by spotlighting in areas of suitable vegetation. These surveys were conducted after habitat assessments and desktop investigations were performed utilising BioNet records; refer **Table 1** below. BioNet searches revealed that the Green-Thighed Frog (*Litoria brevipalmata)* has not been historically identified as inhabiting the Study Area or its local surrounds. Current research indicates this species is "*almost exclusively confined to natural or artificial ephemeral water bodies*" (Lemckert et al. 2006). Given the lack of historical records, permanent waterbodies, and potentially unsuitable breeding habitat (given the		***spotlighting searches, stationary listening points.***  **Klienfelder dark blue lines indicate nocturnal herp survey.** **Survey effort by Klienfelder in this Typha area was for Giant Dragonfly on the 10th December 2020 .**	

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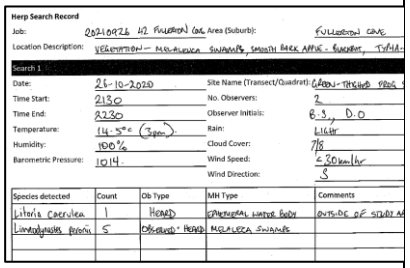
	high levels of salinity) within the Study Area, surveys for this species are deemed adequate. The Wallum Froglet's (*Crinia tinnula*) preferred habitat is melaleuca swamps accompanied with poor drainage, which was identified on site. However, this species requires acidic water (pH 4.3-5.2) which is not present within the brackish waters located within the local surrounds. This is supported by the distribution of historical records within the BioNet data, whereby records of this species are confined to areas with higher acidity. Given the unsuitability of the habitat on site, also with the absence of any BioNet records within the Study Area, surveys completed for this species have been adequately undertaken. Similarly to *C. tinnula*, Mahony's Toadlet (*Uperoleia Mahonyi*) research indicates		 **Klienfelder Green -thighed frog survey 9:30—10:30pm X 2 pp = 120mins on the 26/10/2020**  Herp Search Record Job: 20210926 H2 Fullerton Cove Area (Suburb): Fullerton Cove Location Description: Vegetation – Melaleuca swamps, smooth back apple - blackbutt, typha- Search 1 Date: 26-10-2020 Site Name (Transect/Quadrat): Green-thighed frog Time Start: 2130 No. Observers: 2 Time End: 2230 Observer Initials: B.J, D.O Temperature: 14.5°c (7pm). Rain: Light Humidity: 100% Cloud Cover: 7/8 Barometric Pressure: 1014. Wind Speed: 6.30km/hr Wind Direction: S Species detected / Count / Ob Type / MH Type / Comments Litoria Caerulea / 1 / Heard / Ephemeral water body / outside of study area Limnodynastes peronii / 5 / Observed + Heard / Melaleuca swamps On engagement for the project, AEP reviewed the Port Stephens Council Approved **Klienfelder** BDAR and used this to inform our team and our	

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	this species prefers an acidic environment and not the more alkalotic environment brackish waters offer. This is supported by the distribution of historical records within the BioNet data, whereby records of this species are confined to areas with higher acidity levels. Additionally, research indicates that this species is "*much more likely to be detected when surveyed for from sunset and after dark (i.e. from 6 pm during the main calling period)"* (De Angelis & Cleeland, 2023), thus surveys performed by AEP ecologists were completed at an appropriate time to target this species. Green and Gold Bell Frog (*Litoria aurea*) was not identified as occurring historically within the Study Area according to BioNet records with 14 records within a 10km search area of the Subject Site. This species is known to tolerate the high pH of brackish waters; however		knowledge of the Study Area. As Council had recently approved the BDAR, the information provided above stated there was no suitable habitat for the above listed amphibian species and was supported by Council. To ensure diligence AEP undertook habitat surveys and as previously provided thoroughly researched the required habitat for each of the species using our internal Amphibian staff for the BDAR produced. After the detailed habitat and desktop investigations AEP came to the same conclusion that both Klienfelder and Port Stephens Council had previously, that the Subject Site did not have suitable habitat. At Council's request AEP undertook surveys in accordance with the Guidelines by suitably qualified staff and supporting students, during the correct timeframes, and suitable rainfall periods. The species were not detected during these surveys, AEPs suitably qualified Ecologist, concluded this is	

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	research has indicated that higher levels of salinity may disrupt breeding cycles, which may account for the absence of this species. Additionally, this species requires slow moving, permanent waterbodies for breeding, which were not located within the Study Area. The Study Area does contain potential foraging habitat and given this species tolerance of higher salinity levels; the survey effort was designed to optimally target this species. The surveys conducted by AEP ecologists were performed at sunset instead of last light as this is a diurnal species and the only threatened amphibian species with suitable habitat located on site. Overall, there is a shallow brackish waterbody within the Study Area in the south, a mapped hydroline to the north outside of the Subject Site and some areas within the site is dominated by		due to there not being suitable habitat. Council comment on survey effort around the Typha is not correct, AEP undertook surveys around the Typha as would all Ecologists during a rainfall event for surveys. AEP staff contacted Natalie Black, the accredited assessor during the surveys to discuss the options due to the dense, thick nature of the Typha, as required by AEP Work Place Health and Safety Standards. It was determined due to the dense nature and uncertain potential water depth of this ground water dependant vegetation zone, with no standing water bodies present, the likelihood of injury was high, therefore to ensure AEP Ecologists were safe during the nocturnal surveys, Natalie Black the Accredited Assessor, determined the Typha patch was to be surveyed around the edge as required for all potential waterbodies. The survey would consist of spotlighting, call playback, recordings and visual observations. All acceptable methods around the edge of impenetrable vegetation. Recordings were made during this	

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	Typha orientalis, but there are no permanent waterbodies within the Subject Site. The groundtruthed PCTs were 1646, 1717, 1728 and 1737, which contain alluvial soils and a slight alkaline environment. Due to the lack of waterbodies (ephemeral or permanent) no frogs were heard nor observed within the Subject Site during the frog surveys undertaken by AEP. One frog species was observed and heard within the Study Area. *Crinia signifera* (Eastern Common Froglet) was the only frog observed and heard during the frog surveys. *C.signifera* was heard and observed within the Study Area but not the Subject Site. This frog is known for occupying brackish waters and has been shown to tolerate moderate to high salinity levels, with tadpole mortality only occurring in extremely high saline		inspection (refer **Appendix E**)) and its noted (and as re-iterated) that no frog calls were heard from any species within the Subject Site by AEP. Please also refer to **Appendix F** – AEP WHS Policy and **Appendix G** for AEP generic SWMS example. Substantial habitat assessment and further evidence has already been provided to PSC by AEP in the BDAR and RFI, we request that PSC review this. • "*Water quality parameters indicating hydrological data to substantiate claims of salinity and acidity reported by AEP*" can be provided if deemed necessary ex M&P/Northrop however it is noted Geotech work was not able to be undertaken due to archaeological considerations. Alternatively AEP can collect a sample for analysis of the tidal influenced groundwater	

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	environments (e.g. pure sea water) (Hopkins et al., 2020). Therefore, *C.signifera* being the only frog present on site is consistent with the breeding and foraging habitat available within the Study Area. iii. Threatened Frog surveys were undertaken in accordance with the 'NSW Survey Guide for Threatened Frogs.' As indicated in **Table 1**, surveys by Kleinfelder and AEP were undertaken during the specified survey periods in accordance with the BAM-C of the for Green and Golden Bell Frog (*Litoria aurea*), Green-Thighed Frog (*Litoria brevipalmata*), Mahony's Toadlet (*Uperoleia mahonyi*) and Wallum Froglet (*Crinia tinnula*). As specified in Section 2.5 of the '*NSW Survey Guide for Threatened Frogs*', surveys were conducted following		when dilution from rain event is not evident. • "*AEP did not provide information on the level of flooding observed in the wetland areas of the site at the time of survey. Guidelines for Mahony's Toadlet require waterbodies to be at least 70% full prior to survey. Frog survey guidelines require that water level be reported in the BDAR. AEP reported that due to the lack of waterbodies (ephemeral or permanent) no frogs were heard nor observed within the Subject Site during the frog surveys undertaken by AEP. However, this claim is not accepted by Council as the site contains wetland vegetation that periodically floods and provides ephemeral waterbody habitat ".* The Subject Site was surveyed for frogs by AEP on 22&23/02/2023 following 'NSW Survey	

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	rainfall events. Details of these rainfall events are located within the BDAR (**Tables 15** and **16**), and are further clarified in **Table 2** below. As stated within this section "*evidence suggests most species of frog call actively at the beginning of the evening when conditions are warmest, with calling trailing off as the night progresses, However, for some species calling can extend into the day or later in the night, during suitable conditions*." Given the only threatened frog with suitable habitat was the diurnal Green and Gold Bell Frog (*Litoria aurea*), surveys were tailored to increase the likelihood of locating this species. Additionally, the ambient temperatures at the time of AEP surveys were uncharacteristically low for February, however due to drought conditions this was the most optimal time to survey threatened frogs on		Guide for Threatened Frogs'. No standing waterbodies were observed after a rainfall event of >50mm within a 24hr period within the Subject Site. The presence of aquatic vegetation (*Typha sp.* etc) is likely indicative of a Groundwater Dependant Ecosystem (GDE). The Subject Site occupies a low-laying depression in Fullerton Cove on the Stock Groundwater Source. The aquatic vegetation is supported by the depressed landscape and groundwater near the surface, allowing the vegetation to act as phreatophytes, without the ephemeral waterbodies required to support Frogs. No frog calls were heard from the area dominated by Typha, while nearby ephemeral waterbodies displayed multiple frog calls (albeit one species), indicating the GDE lacks the habitat features to	

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	site. The average temperature in February when these surveys were undertaken is 27.7oC, however the average temperatures on the 22nd and 23rd of February by AEP were 20.5 and 21.5oC. These uncharacteristically low temperatures combined with minimal rainfall events resulted in AEP ecologist making the educated decision to commence surveys at sunset opposed to last light, thus utilising warmer temperatures. Section 2.6 of the 'NSW Survey Guide for Threatened Frogs,' requires surveys to be conducted in suitable breeding and non-breeding habitat. No suitable breeding habitat exits within the Study Area due to the absence of waterbodies. Non-breeding habitat is described as "*generally broad and may be related to one or more vegetation types*," thus as a precautionary measure the		support the presence of frogs. Analysing all of the data, • Council approved BDAR, stating there is no suitable habitat for the species on site, • Results of desktop research on what habitat the species requires, noting not present within the Subject Site; • Additional habitat assessment, showing no suitable habitat; • Detailed surveys of the Subject Site, all undertaken in accordance within the seasonal, rainfall and methodology; All of the above investigations did not result in any evidence of the listed species being present within the Subject Site. **Therefore, no species credits apply.**	

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	site was surveyed for each of the threatened frog candidate species and as a request from Port Stephens Council. This survey effort was designed with the guidelines outlined in section 2.7, whereby "*Only those parts of the subject land that are considered potential habitat require survey*." In this way the survey effort focused on the plant community types ground-truthed within the Study Area which were consistent with the habitat requirements for the amphibians in question. As demonstrated in **Figure 8** of the BDAR, survey efforts undertaken by AEP were concentrated to the northern hydroline outside of the Subject site and surveyed all PCT's on site which included PCT 1737 *Typha Rushland* and PCT 1717 *Broad-leaved Paperbark*, as potentially suitable amphibian habitat on site, albeit without water bodies.			

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	Furthermore, the survey method undertaken by both Kleinfelder and AEP ecologists were consistent with the guidelines, in particular section 2.9.1, utilising aural-visual surveys. This involved spotlighting and call identification, as indicated in **Figure 8** of the BDAR, with numerous listening points included in this survey effort. Although no breeding habitat was identified on site, call-playback was also utilised as a precautionary measure. Tadpole searches were deemed inappropriate for this site given the absence of any waterbodies within the Subject Site. iv. Section 2.8 of the guidelines refers to standard level of survey involving a 500m transect and 50m2 tadpole search of water areas. As no waterbodies and minimal appropriate habitat were located within the Subject			

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	Site the survey effort was modified. As discussed above, the survey effort was concentrated off the northern hydroline and the Subject Site was surveyed throughout and plus areas outside of the Subject Site as areas were identified by AEP ecologists as the most suitable amphibian habitat within the surrounds. As stated above, all surveys were completed during appropriate rainfall events. Kleinfelder surveys were completed during 128.8mm and 14.8mm of rainfall while AEP surveys were completed during 45.6mm and 35mm rainfall. Given the historical drought records of the area, the most optimal rainfall events were utilised to perform these surveys with surveys aimed earlier whilst rainfall was occurring. Additionally, council was emailed regarding concerns			

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	about completing such surveys in the prior drought conditions, however, no response was received. v. Section 2.11 of the guidelines details the required documentation for the threatened frog surveys performed. The details of these surveys are included within the BDAR, however for ease of clarification these have been summarised in **Table 2 below**. 2.11.2 of the guidelines refers to species polygon mapping. As no threatened frog species were located within the Study Area, this mapping was not required.			
2. Please amend Figure 8 of the BDAR to correct the survey tracks titled 'Fauna Meander' as these tracks are targeted flora surveys done by Kleinfelder, not fauna survey tracks.	Refer **Figure 8** within BDAR amendments.			

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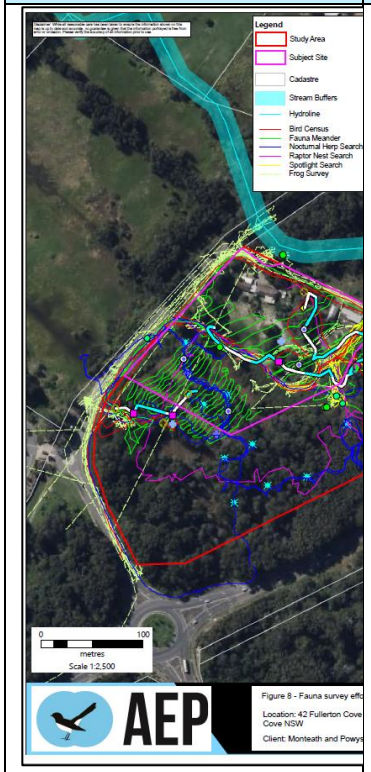	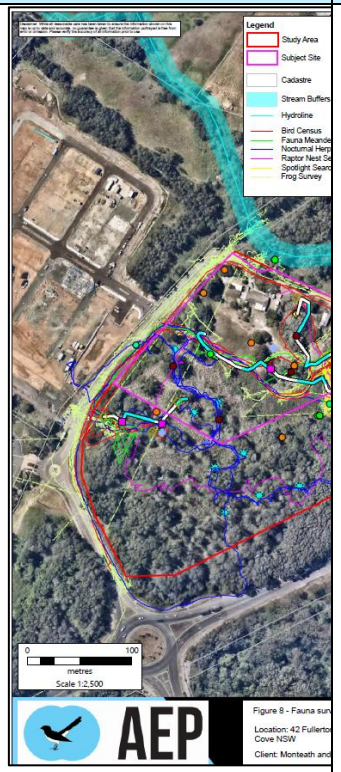 **Figure 8 also attached Appendix C**			
3. Please provide camera trap locations for Brush-tailed Phascogale Surveys.	As above Refer **Figure 8** within BDAR amendments.			

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4. Avoidance of impacts has been considered with review of both the Kleinfelder BDAR (submitted for the Planning Proposal) and the AEP BDAR for the site. At the time of the rezoning it was considered that the area of forested wetlands / EEC in the south of the proposed development footprint provided limited habitat for threatened species. However, frog surveys have not been confirmed to meet minimum survey guidelines. Should threatened frogs occur within the wetland area of the site, this area should be considered an area of very high biodiversity value and impacts further avoided within this area (see figure below for details).	Targeted threatened frog surveys were considered by AEP to be sufficient given the habitat constraints within the Subject Site given that the NSW Survey Guide for Threatened Frogs is a guideline for within suitable habitat only. This is not an area of HBV/HEV for threatened frogs. ''High Environmental Value is used instead of 'high biodiversity value' as the criteria include features on a range of values including, but not limited to, biodiversity'' OEH 2015 Refer **Appendix A for BCD HEV Criteria assessment** Of the 6.86ha Study Area, 0.277ha of the 2.46ha Subject Site are TEC's under the BCD criteria and therefore **considered HEV.** This is equivalent to 11.2% of the Subject Site and 4% of the Study Area being impacted.	Incorporated in **comment 1**		

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
 **EEC and wetlands Mapped Area**	PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* is recorded as 81% cleared, therefore **is a HEV** and impacts to this area for signage purposes to an area of less than 0.007ha. Frog Surveys undertaken across the site had a focused survey effort within areas close to water sources present outside of the Subject Site i.e. northern hydroline and southern wetland area not dominated by Typha with canopy trees of *Melaleuca* and *Casuarina* and holding some water as no water bodies were located within the Subject Site. Some of the wetland areas appear to have a tidal influence and are periodically inundated. Most areas of PCT 1737 lack open water due to the density of *Typha orientalis* that dominates this community with a moderate VIS of 59.1.			

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	PCT 1717 contains a large portion of the ground cover that is dominated by rushes; *Triglochin sp*. *Typha orientalis* and *Baumea articulata* and is in poor condition with a VIS of 35.5. This area was not considered to consist of breeding habitat as all required field work was undertaken to identify potential breeding habitats on the land for threatened species. Assumed breeding occurrence and maps identified breeding habitats on the land as HEV for Southern Myotis and Common Planigale Refer Species Polygons for **Figures 10 & 11** of the BDAR. Please refer to **Figure 8** of the BDAR for survey effort and it is noted that the EEC and wetlands area mapped within the Subject Site highlighted as high biodiversity value (figure to the left) of approx. 0.73 ha (or approx. 70m X 100m)			

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	contains a thick *Typha* ground cover that could not easily be transversed and was considered not required to be entered into based on no frogs calling within this area nor answering to call playback upon the fringes. The accredited assessor and AEP senior management deemed that this Typha area was too thick and impenetrable and unsafe to enter when conforming with safe work practices, hence survey tracks indicate the accessible areas, even from outside the Subject Site.			

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	 ***Typha orientalis*** **dominated ground cover (Kleinfelder).** 			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	Cleared area heading into blackberry thickets and Typha dominated thicket (AEP)			
5. The species polygon for the Common Planigale must be redrawn and recalculated in accordance with the requirements detailed in the Threatened Biodiversity Data Collection (TBDC).	Refer to **Figure 11** amendment mapped to Near Map imagery that more adequately reflects the canopy present within the Subject Site. TBDC Polygon Guidelines: the species polygon is drawn to 500 m either side of the PCT ecotonal boundary, or to the other PCT boundary, whichever is smaller. Note the ecotonal zone is the boundary between a 'wet' PCT and a 'dry' PCT. Under drier conditions, the species moves into the lower elevation 'wet' PCT, and under wetter conditions it moves upslope to the higher elevation 'dry' PCT. This species was mapped to canopy only due to the highly degraded site conditions and presence was assumed as AEP could not undertake	**Common Planigale species polygon** AEP maintain that their species polygon for Common Planigale should be able to exclude non-treed areas, as the credit obligation is considered unreasonable given that there is minimal suitable habitat. This is not an acceptable justification in accordance with the BAM 2020 and species guidelines. *Information requirements:* 1. The species polygon for Common Planigale must be redrawn and recalculated. 2. Alternatively, if AEP are of the opinion that the habitat on site is not suitable, an expert report may be prepared.	AEP would have preferred to conduct surveys for Common Planigale but are respectful of archaeological matters. Potential habitat within Study Area, minimal logs/shelter within Subject Site and managed area has been discounted as suitable habitat although species is associated with all PCT's on site. Only one BioNet record (2018) that was recorded by camera, within the locality and close to the Study Area was identified on BioNet records. The species polygon encompasses 1.28ha of the Subject Site which equates to 18 credits @ approx $1070/each = approx $20k. A 2.27ha polygon is approx $34k To re-iterate: In accordance with the DCCEEW *Survey guidelines for Australia's threatened mammals*; *These guidelines are not mandatory. Proposals failing to meet these survey guidelines for reasons of efficiency, cost or validity will not*	Refer to response above where PSC determined (during the 30/5/2024 site inspection) that the existing polygon was suitable.

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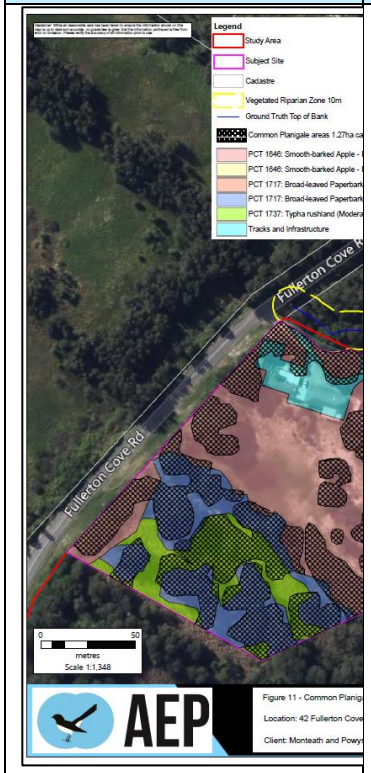	pitfall surveys due to archaeological matters, specifically the presence of Aboriginal heritage artifacts. Presence was assumed as per PSC recommendation 9/2/2023; "*Given the survey difficulties and the potential for camera trapping to be inconclusive, it may be more cost and time efficient to assume presence for this species*" as per Ashley Bacales. Assuming the whole site and increasing the credit load of Common Planigale is unreasonable given that there is minimal suitable habitat.		*necessarily default to a judgement that referral is required (that is, that a significant impact is likely), especially where the proponent issues an evidence-based rationale for an alternative survey approach. Alternatives to a dedicated survey may also be appropriate. For example, a desktop analysis of historic data may indicate that a significant impact is not likely. Similarly, a regional habitat analysis may be used to inform judgement of the likely importance of a site to the listed mammals. Proponents should also consider the proposal's impact in the context of the species' national, regional, district and site importance to establish the most effective survey technique(s).* AEP contacted a Planigale expert – David Milledge (9/01/2023) "I'm also not accepting any additional work outside the NSW North Coast this year", and PSC could not provide another expert, hence assumed presence. Considerable correspondence with PSC was shared in relation to this matter with alternatives offered.	

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	 **Figure 11 also attached Appendix C**		AEP contacted David Milledge 8/05/2024 to assess his availability. Response received on the same day: "I'm totally over-committed, plus I've stopped doing Common Planigale expert reports. Unfortunately I can't suggest anyone else at present". AEP are happy to meet on site with PSC Ecologists and discuss the habitat values and potential for Common Planigale to utilise the Subject Site.	
6. Further consideration of impact avoidance is required for the area identified in Figure	**BACKGROUND**	**Issues associated with the requirement to avoid and minimise impacts**	Avoid and minimise within the Subject Site has been discussed further with M&P and several team meetings and discussions had.	

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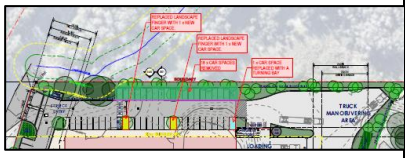
1 above. Where impacts can be further avoided / reduced they should be and this should be reflected in revised plans and a revised BDAR. For example, has it been considered whether parking could be reduced or redesigned to reduce impacts to the area of EEC and wetlands? What has determined car park numbers requirements? Could rooftop parking be incorporated into the design to further reduce impacts? Please provide details of any design iterations and how these designs responded to both the project need and the biodiversity values of the site. Where impacts cannot be further avoided, please provide details to justify impacts on the area of EEC and wetlands.	**Local Need:** Fern Bay and Fullerton Cove are currently serviced by an IGA supermarket in Stockton, 8 km south, and a general store in Salt Ash, 14 km north. Both are within a 15-minute car ride or 30-minute bus ride, though public transport is limited. The Stockton supermarket covers around 600 sqm, mainly catering to local convenience needs. The Salt Ash store spans about 450sqm, primarily serving top-up needs. Residents are required to travel long distances for typical day-to-day convenience shopping. Further, the shift in supermarket shopping habits towards more frequent purchases of fresh items and prepared foods, coupled with less frequent shopping for packaged goods, is driving the trend of smaller, more numerous supermarkets, particularly in urban areas. The impact on Fullerton Cove and Fern Bay residents by the lack of basic supermarket facilities is considered	The question remains why impacts to the area of endangered vegetation and LEP mapped wetlands cannot be reasonably avoided or minimised as previously requested. *Information requirements* 1. Further justification is required, including justification for the number and size of additional retail spaces within the supermarket centre, which in addition to having a direct impact footprint, also directly correlates to the number of car spaces that are required to be provided. 2. With the current design, further avoidance should be considered along the southern boundary. See example in Figure 2 below. **Figure 2 - Potential avoidance area shown in yellow outline (left); Mark-up showing minor design amendments to achieve avoidance (right) – Please note that avoidance areas cannot be cleared and landscaped. Natural vegetation within these areas need to be retained** 	The variation and areas ground-truthed as PCT 1646 may be as result of scale to which the LEP mapped wetlands was created and / or no ground – truthing or changes to the hydrolines located in the northern adjoining allotment. The Study Area contain small patches of wetland complex and areas of forested wetlands which are periodically inundated. Majority of the Subject Site has historically been cleared of native vegetation and managed regularly. Alterations to the topography of the site has likely resulted in changes to the hydrological regime which have likely affected these areas of forested wetlands and wetland complex. A portion of the vegetation within the west of the Study Area and Development Site has been identified in the BOM Groundwater Dependent Ecosystem Atlas as high potential Groundwater Dependent Ecosystems (GDE). Historical imagery below indicating prior clearing below.	Further to response above, amendments have been incorporated in the revised site plan, including the relocation of the kiosk substation and reduction in car park footprint.

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	significant. With little to no current opportunity to meet these needs or provide for the changing dynamic and trends of supermarket services within the area. In this regard, it was determined that a Supermarket development within the Fullerton Cove area would be the best means of addressing the local need and a petition was signed by more than five hundred (500) residents. **Site Selection Consideration:** An existing zone E1 area adjacent to the Seaside Fern Bay estate was considered in the site selection process and rendered unsuitable due to exposure constraints to major arterial road and limited opportunity to attract passing trade. Further, the site does not maintain exposure to inward traffic due to existing vegetated lane separation, and its proximity to future residential land uses provides restricted separation options. Also, the site was proposed to be rezoned to residential		**Subject Site in 1966**  **Subject Site in 1976**  **Subject Site in 1998**	

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	during the lodgement of the Planning Proposal. In contrast, the Subject Site maintains great exposure to a major arterial road, centrally located and accessible for residents of both the Fern Bay and Fullerton Cove areas. The site is also afforded opportunities to attract passing trade. Subsequently, a Planning Proposal was lodged for the site to rezone the site from RU2 Rural Landscape to B1 Neighbourhood Centre (E1 Local Centre) and E3 Environmental Management (C2 Environmental Conservation in March 2017). Approximately 2.0 - 2.5ha of land was proposed for rezoning to E1 Local Centre, with up to 2.0 hectares designated for development. The selection of this area was informed by a site analysis that considered flooding and ecology to balance them with operational needs. The remaining portion of the site was proposed to be preserved in its natural vegetated state for rezoning to E3 Environmental Conservation (C2		 To further demonstrate avoid and minimise within the Subject Site, an area along the northern boundary has been extended to the east to further buffer the hydroline located within the neighbouring property that flows into a RAMSTAR wetland. Any further protection of this area is vital. Although many of the large trees in this area are exotic, a threatened species *Syzygium paniculatum* (Magenta Lily Pilly) in good condition is located in this area. 	As discussed above.

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	Environmental Conservation). On 12 October 2020, the Department of Planning and Environment resolved to issue a Gateway Determination in favour of the Planning Proposal. The Planning Proposal was gazetted by the Department on 14 October 2022. Prior design iterations have been included in **Appendix D** which demonstrates the concerted effort to reduce impacts on any C2 zoned and the area of EEC and wetlands with approx. 14.5m increase to the buffer between the E1 and C2 zoning boundaries as displayed below in the **Final development Plan.** Further design reiterations within the E1 zoned land for development included the exclusion of the northern VRZ and the addition of impact area post an Arborist Assessment conducted by AEP 20/02/2024.		An additional area along the southern boundary as indicated by PSC can be avoided as mapped however the additional area as indicated by PSC, impacts will be minimised as modelling requires earthworks. AEP are happy to work with PSC and client to provide a frog pond area with recommendations and therefore improving this area and potentially creating an area where frogs could actually live. Can discuss further on site to refine.	As discussed above, the detention basin will incorporate new plantings typical of groundwater feed system.

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	 **Final development Plan** **CAR PARKING CONSIDERATIONS:** Consideration was afforded to reductions in parking rates and alternative car parking arrangements including the provision of underground and rooftop car parking spaces to minimise land disturbance beyond the proposed building footprint. However, these options were rendered unsuitable for the site and the proposed development. Pursuant to			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	the LEP, the Council may consider reductions in car parking provisions in the following circumstances. • alternative arrangements for parking demand can be provided, e.g., the provision of parking on another site proximate to the development or a courtesy bus. • Where supported by a TIA. • dedicated car sharing service spaces equipped with electric vehicle charging provisions are provided. In this regard, there is no opportunity for the			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	development to provide alternative arrangements for parking demand. Also, it is considered onerous for the proposed development to provide alternative parking arrangements as the required parking provisions are accommodated wholly on the subject site. Moreover, the TIA prepared for the proposed development does not support reductions in minimum parking provisions. Further, dedicated sharing spaces equipped with electric vehicle charging provisions are not proposed as part of this application. As such, the development does not meet the acceptable outcomes to qualify for reduced parking provisions. Rooftop parking was also considered in the initial scoping exercise and was rendered unsuitable. The proposal exceeds the maximum height provisions in its current form. The inclusion of rooftop parking would result in excessive building height provisions which would not demonstrate compliance with Clause 4.6. Considering the length of			

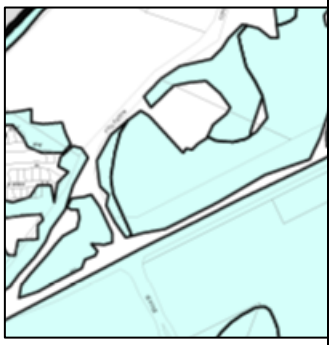
Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	vehicular ramps to a rooftop carpark also, to clear shopping centre ceiling heights, the proposal would be visually obtrusive and the associated costs in attempting both options would be excessive and unsustainable. Similarly, as the development is wholly contained within the approved development zone and the site is constrained by Acid Sulphate Soils and heritage items, and high water-table levels (Fullerton Cove nearby), the provision of underground car parking spaces was rendered unsuitable for the site. TEC area within PCT 1717 (poor) and PCT 1737 (Moderate) totals 0.74ha or 11% of the total Study Area or 30% of the Subject Site that has been predominately cleared and underscrubbed and has been zoned as E1. HEV TEC further reduces this area to 0.277ha or 11.2% of Subject Site or 4% of Study Area being impacted. The principals of avoid and minimise within the Subject			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	Site have been considered, whereby the site fundamentally lacks ecosystem regeneration and connectivity, however proactively creating nature positive outcomes and results that will improve biodiversity values over time from its current state through proposing the following works; - Landscape Plan utilising native endemic species; - Residual land within the Study Area be placed under a Biodiversity Management Plan - Enhancement of flora and fauna habitat within the C2 lands, improving the condition ensuring an improved future vegetation integrity score; - Environmentally-friendly lighting design that avoids light-spill into surrounding areas of native vegetation; - Water quality and quantity treatment devices designed to ensure an improvement; - Fencing where relevant, to reduce the likelihood of edge effects and prevent			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	fauna incursions in active commercial land. - Avoid and minimise principles were considered through the planning stage of the proposed development as well as the location within the wider lot. The location of the land to service the requirements of residential development in Fullerton Cove that has been zoned appropriately (E1) with residual C2 lands, therefore, the proposal is considered a suitable position for the Subject Site. The thorough investigation and design iterations during the Planning Proposal ensured the principles of avoid and minimise by utilising the lower quality cleared land that continues to be managed whilst the area containing higher quality vegetation of biodiversity value will be retained, illustrating that the development is located within the most suitable, disturbed part of the site.			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	Furthermore, the preparation of a Biodiversity Management Plan for the C2 land, implementation of the principles of water sensitive urban design and landscaping within the Subject Site will contribute to the minimisation of impacts throughout. Overall, the impact area has moderate to high levels of degradation, with high weed loads and presence of high-threat exotics (HTE). Clusters of moderate quality native vegetation border three sides of the Subject Site, and connect into adjacent lots. Creating a nature positive outcome on a site that has minimal biodiversity value across the majority of the site has been part of a reiterative process. If the Subject Site was not developed, weeds and exotic species would become more dominant and VIS's would continue to decline, but with the BMP and stormwater management plan the vegetation and water within the area will significantly improve. This proactive approach presents a nature positive outcome for all local flora and fauna			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	species present, and provides greater protection for the RAMSAR Wetlands.			
7. The development (as currently proposed) will impact an area of LEP mapped wetlands (please refer to Figure 1 above). In accordance with Section 7.9 of the Port Stephens LEP, further justification is required detailing why impacts to this area cannot be reasonably avoided. ***7.9 Wetlands*** *(1) The objective of this clause is to ensure that wetlands are preserved and protected from the impacts of development.* *(2) This clause applies to land identified as "Wetland" on the Wetlands Map.* *(3) Before determining a development application for development on land to which this clause applies, the consent authority must consider—* *(a) whether or not the development is likely to have*	The Study Area covers approx. 6.86ha and the Subject Site zoned Local Centre (E1) totals approx. 2.46ha, with the remainder of the land zoned Environmental Conservation (C2) totalling approx. 4.40ha. The current proposal involves the clearing of a small percentage of the mapped wetlands occurring on site. The proposal avoids the majority of this mapped wetland area (see below) within the Study Area with only a small area of the EEC (11% or 0.74ha of total Area), in poor and moderate condition, proposed for removal. This area has been approved for rezoning within the E1 zone. The remainder of the Subject Site consists of predominately of PCT 1717 with also wetland TEC PCT's of 1737 & 1728 being retained and enhanced under a BMP totalling an area of 4.40ha. Further protecting and enhancing this mapped wetland area under a BMP is a nature positive outcome	Refer above Avoid and minimise.		

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
any significant adverse impact on the following— *(i) the condition and significance of the existing native fauna and flora on the land,* *(ii) the provision and quality of habitats on the land for indigenous and migratory species,* *(iii) the surface and groundwater characteristics of the land, including water quality, natural water flows and salinity, and* *(b) any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.* *(4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—* *(a) the development is designed, sited and will be managed to avoid any*	which is far better than doing nothing and continuing as is.  **LEP Wetlands mapping** The proposed development has been positioned primarily within the unmapped wetland areas of the Study Area with 4.24ha zoned as C2-Environmental Conservation. The Study Area (including parts of the Subject Site) contain small patches of wetland complex and areas of forested wetlands which are periodically inundated. Majority of the Subject Site has historically been cleared of native vegetation and managed regularly. Alterations to the topography of the site has likely resulted in changes to the hydrological			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
significant adverse environmental impact, or *(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or* *(c) if that impact cannot be minimised—the development will be managed to mitigate that impact.*	regime which have likely affected these areas of forested wetlands and wetland complex. Impacts to Freshwater Wetlands EEC will be limited to 0.27ha within land when rezoning occurred to *E1: Local Centre* (Subject Site). A total of 0.22ha will be retained as part of the proposed rezoning of land from *RU2: Rural Landscape* to C2*: Environmental Conservation*. Additionally, the rezoning of land from *RU2: Rural Landscape* to C2*: Environmental Conservation*, good condition vegetation (PCT 1717) likely commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, will be retained. Retained vegetation containing good structural complexity, especially moderate condition PCT 1717 and moderate condition PCT 1646, likely provides			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	suitable foraging and potential roosting habitat for the Powerful Owl (*Ninox strenua*) a threatened species detected outside of the Development Site during surveys. Given the proximity of the proposed development to the Hunter Estuary Wetlands, A Storm Water Management Plan will be prepared for the proposed development. Therefore, it has been determined that the biodiversity within the Study Area will significantly improve and be protected with the implementation of a BMP on the retained land. This is a nature positive approach in enhancing and protecting the area. Should the Subject Site not be developed, an increase in exotic weeds is expected.			
8. Within the landscape plan there are 5 trees identified for removal along the eastern boundary that are either on the border of the conservation zone boundary or within the	An Arborist Impact Assessment has been conducted and an **additional impact area of 0.0172ha to PCT 1646** will need to be included with 5 trees	**Tree removal in C2 Zoned land** There are 5 trees identified for removal along the eastern boundary of the site that are within the conservation zone (C2) area. Two of	The BAMC cannot be re-opened at this late stage without reverting to the new STVM PCT's with the potential for additional survey requirements. AEP will consider adding an additional credit for	In addition to the discussion above, an updated Arborist Report has been attached and amendments have been incorporated in the revised site plan.

<table>
<tr><th>Port Stephens initial Request for Further Information – Ecology March 2024</th><th>AEP Response March</th><th>Port Stephens further request for Further Information – Ecology May 2024</th><th>AEP response May</th><th>Site Inspection with AEP, M&P and PSC 30/5/24 and final comments</th></tr>
<tr>
<td>conservation zone area. It is currently unclear whether one of these trees is a hollow bearing tree as identified in the BDAR. Removal of these trees is inconsistent with the C2 zone objectives of the LEP and impacts have not been assessed under the BDAR. Impacts to the two northernmost trees appears to be avoidable without design changes. However, amendments to the design may be required to avoid impacts to the other three trees. An arborist report should be provided to demonstrate that impacts will not result in the damage or death of these trees.</td>
<td>encroaching the Subject Site within the BDAR and no previously mapped HBT's will be impacted.

Arborist Impact Assessment Report has been provided; in summary –

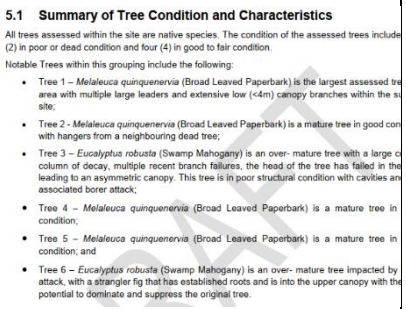
<table>
<tr><th rowspan="2">Tree Assessment</th><th colspan="3">Retention Value (Tree No)</th><th rowspan="2">Total</th></tr>
<tr><th>High</th><th>Moderate</th><th>Low</th></tr>
<tr><td>Remove (TPZ/SRZ Encroachment)</td><td></td><td>Trees 1, 4, 5,</td><td></td><td>3</td></tr>
<tr><td>Remove (Development Footprint)</td><td></td><td>Trees 3, 6</td><td></td><td>2</td></tr>
<tr><td>Total Tree Removal</td><td>0</td><td>5</td><td>0</td><td>5</td></tr>
<tr><td>Retain (Protection fencing)</td><td></td><td>Tree 2</td><td></td><td>1</td></tr>
</table>
</td>
<td>these trees are Swamp Mahoganies, which area a preferred koala feed tree. Removal of these trees is considered inconsistent with the C2 zone objectives of the LEP.

Information requirements

1. Design amendments should be considered to enable retention of these trees.

2. If avoidance cannot be achieved an additional impact area of 0.0172ha to PCT 1646 will need to be included within the BDAR and BAM-C</td>
<td>impacts of 0.0172ha despite the fact that this probably would not be the case within the impact area calculated. It is noted that one credit was also applied for minimal impacts within the signage area of 0.007ha.

Further design amendments have been discussed within the team and the identified Swamp Mahoganies can be retained albeit they are in poor condition.

 
5.1 Summary of Tree Condition and Characteristics
All trees assessed within the site are native species. The condition of the assessed trees include
(2) in poor or dead condition and four (4) in good to fair condition.
Notable Trees within this grouping include the following:
• Tree 1 – Melaleuca quinquenervia (Broad Leaved Paperbark) is the largest assessed tre
area with multiple large leaders and extensive low (<4m) canopy branches within the su
site;
• Tree 2 - Melaleuca quinquenervia (Broad Leaved Paperbark) is a mature tree in good con
with hangers from a neighbouring dead tree;
• Tree 3 – Eucalyptus robusta (Swamp Mahogany) is an over- mature tree with a large c
column of decay, multiple recent branch failures, the head of the tree has failed in the
leading to an asymmetric canopy. This tree is in poor structural condition with cavities an
associated borer attack;
• Tree 4 – Melaleuca quinquenervia (Broad Leaved Paperbark) is a mature tree in
condition;
• Tree 5 – Melaleuca quinquenervia (Broad Leaved Paperbark) is a mature tree in
condition; and
• Tree 6 – Eucalyptus robusta (Swamp Mahogany) is an over- mature tree impacted by
attack, with a strangler fig that has established roots and is into the upper canopy with the
potential to dominate and suppress the original tree.</td>
<td></td>
</tr>
</table>

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	Total Tree Retention | **0** | **1** | **0** | **1** 			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	Location of the six (6) trees included in the AIA. Efforts have been made to avoid impacts on the majority of trees present on site. Out of the fifteen (15) hollow-bearing trees located within the Study Area, all fifteen (15) trees have been retained, thus reflecting consistency with the C2 zone objectives of the LEP. Trees of high habitat value have been retained and those of lower value have been proposed for removal.			
9. The BDAR states that "permanent lighting shall be designed to minimise light spill into surrounding vegetation." Please provide a detailed lighting plan that demonstrates fauna conscious lighting design. The lighting plan should be consistent with the objectives and design principles detailed in the 'National Light Pollution Guidelines for Wildlife' (DCCEEW 2023).	AEP can include the lighting plan in the BDAR Appendix now that it has been provided: *Northrop Electrical Report 42 Fullerton Cove Road, Fullerton Cove 21 Mar 2024* summarises the following: Best practice lighting design principles to reduce light pollution: • Start with natural darkness and only	Accepted		

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	add light for specific purposes. • Use adaptive light controls to manage light timing, intensity and colour. • Light only the object or area intended – keep lights close to the ground, directed, and shielded to avoid light spill. • Use the lowest intensity lighting appropriate for the task. • Use non-reflective, dark-coloured surfaces. • Use lights with reduced or filtered blue, violet and ultraviolet wavelengths Please refer to Northrop report for further details which			

Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
	will also include the Business Signage within the C2 lands.			
		Impacts from Servicing Please confirm if there is vegetation removal or ecological impacts as a result of the required upgrades to Fullerton Cove Road and/or as a result of the sewer servicing works. If there are impacts, these needs to be clearly identified in the BDAR.	Arborist & Ecologist have assessed at desktop level and no impacts are applicable as it has already been cleared by the Ingenia development via their approved DA.	AEP further ground truthed area 28/05/2024 and confirmed no impacts due to previous clearing. Ingenia have advised the ecological implications of the works in the Fullerton Road reserve have been addressed with Council through the contractors CMP. To provide further clarification, refer to MJD Environmental EA **Appendix I** where in summary: "Generally, the study area associated with the concept sewer main is characterised by disturbed habitat containing exotic vegetation".

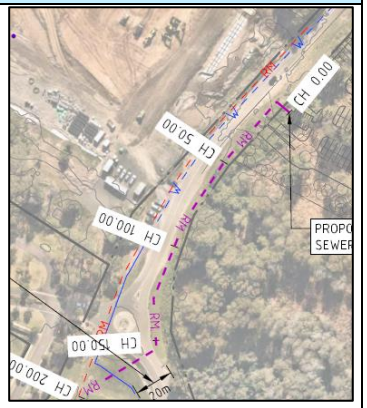
Port Stephens initial Request for Further Information – Ecology March 2024	AEP Response March	Port Stephens further request for Further Information – Ecology May 2024	AEP response May	Site Inspection with AEP, M&P and PSC 30/5/24 and final comments
				

Table 1 Threatened Frog BioNet Records

Species	NSW Status	Commonwealth Status	BioNet Records			Species Detected During Surveys	Suitable Habitat within the Study Area		Survey Timing		
			Total	Closest Proximity	Most Recent		Breeding	Non-Breeding	Survey Period in accordance with the BAM-C	Month Survey was Undertaken	
										Kleinfelder	AEP
Green and Golden Bell Frog *Litoria aurea*	E	V	14	2011 1.9km south	2020 4.1km south-west	N	N	Y	November - March	October, December	February
Green-Thighed Frog *Litoria brevipalmata*	E	-	0	N/A	N/A	N	N	N	September - April	October, December	February
Mahony's Toadlet *Uperoleia mahonyi*	E	E	15	2021 1.5km south	2022 3.1km east	N	N	N	October - March	October, December	February
Wallum Froglet *Crinia tinnula*	V	-	25	2022 1.2km south-west	2022 1.2km south-west	N	N	N	All year	October, December	February

Table 2 Survey Documentation

Date	Timing									Method	Effort	Critical Habitat Features	Identification
	Temperatures (°C)		Rainfall (mm)			Humidity (%)	Barometric Pressure	Wind	Cloud Cover	Moon Phase				
	Min	Max	Previous 24 hours	7 Days	Month								
26/10/2020	13.7	16.8	128.8	42.4	252.0	100	1014	50 SSE	7/8	Waxing Gibbous	Aural-visual surveys	GPS recording of qualified surveyor's	No waterbodies present on site, Surrounding water brackish	Peron's Tree Frog (*Litoria peronii*) – OW Green Tree Frog (*Litoria caerulea*) - W
16/12/2020	21.3	29.9	14.8	6.4	156.2	74	-	31 NE	-	Waxing Crescent	Aural-visual surveys	GPS recording of qualified surveyor's	No waterbodies present on site, Surrounding water brackish	Eastern Dwarf Tree Frog (*Litoria fallax*) – W Peron's Tree Frog (*Litoria peronii*) – W Tyler's Tree Frog (*Litoria tyleri*) - W
21/12/2021	21.9	30.6	0.2	2.6	20.4	71	-	20 SE	-	Waning Gibbous	Aural-visual surveys	GPS recording of qualified surveyor's		-
23/12/2021	22.4	-	0	2.8	20.4	84	-	ENE 13	-	Waning Gibbous	Aural-visual surveys	GPS recording of qualified surveyor's	As above	-
22/02/2023	19.8	21.2	45.6	3.2	107.4	93	1022	28 SE	8	Waxing Crescent	Aural-visual surveys	GPS recording of qualified surveyor's	No waterbodies present on site, Surrounding brackish water	Common Eastern Froglet (*Crinia signifera*) – O, W
23/02/2023	18.3	24.6	35	47.8	107.4	74	1024	19 ESE	8	Waxing Crescent	Aural-visual surveys	GPS recording of qualified surveyor's	As above	Common Eastern Froglet (*Crinia signifera*) – O, W

Key: O = Observed, W = Heard

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Mahony, M. (1996) 'The decline of the green and golden bell frog *litoria aurea* viewed in the context of declines and disappearances of other Australian frogs', *Australian Zoologist*, 30(2), pp. 237–247. doi:10.7882/az.1996.018.

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We note that no amendments have been made to the BDAR that was submitted within the BAM-C until the RFI matters have been adequately addressed and the BAM-C can be reopened to upload V2.

We thank you for the opportunity to be involved in this project. Should you require any further clarification on this matter, please contact Natalie Black (Senior Environmental Manager- 0431 249 360) or myself.

Regards

Anderson Environment & Planning

Kelly Drysdale

Ecology Project Manager

0428 296 470

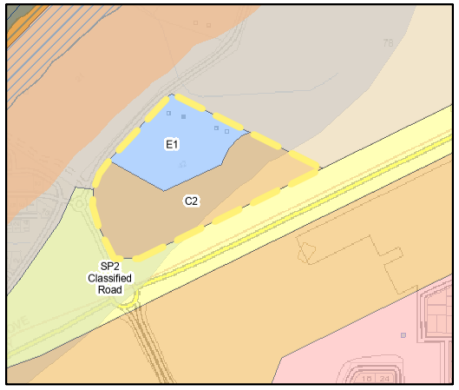
Attachments:

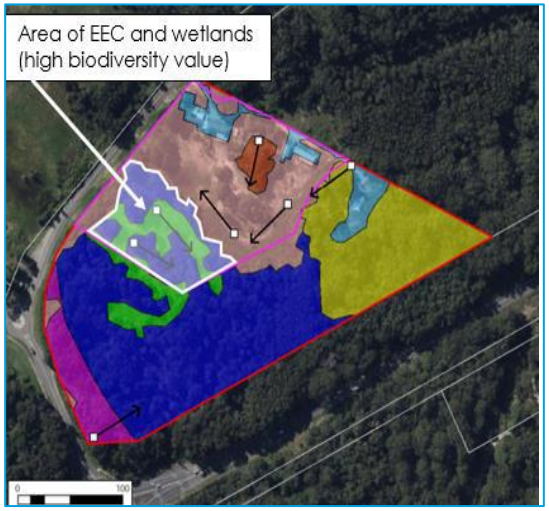
Appendix A:	BCD HEV Criteria
	Annexure A: Sites of geological significance included in the State Heritage Register or Heritage Inventory
Appendix B:	Warwick Muir updated resume as example if required.
Appendix C:	Amended BDAR Figures 8 & 11
Appendix D:	Design iterations
Appendix E:	Frog recordings
Appendix F:	AEP WHS Policy
Appendix G:	AEP generic SWMS example
Appendix H:	Arborist Impact Assessments
Appendix I:	MJD Environmental Eco advice on sewer alignment

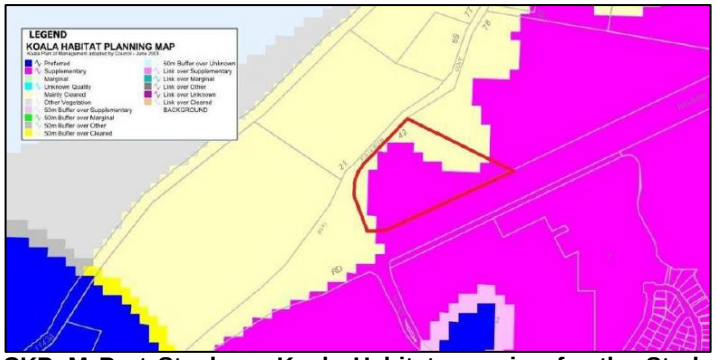
Appendix A - BCD HEV Criteria and Identification Methods at the Property Scale

High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
Criterion 1. Sensitive biodiversity mapped on the Biodiversity Values Map		
1.1 Biodiversity Values Map	a. Identify the parts of the land on the Biodiversity Values Map. b. Inspect those mapped areas on the land to verify accuracy and map as HEV where the map is accurate.	None of the Study Area or Subject Site is BV mapped land and not a HEV.  **BV Mapping of Study Area**
Criterion 2. Native vegetation of high conservation value		
2.1 Over-cleared vegetation types	a. Identify Plant Community Types (PCTs) on the land through field work. b. Register and visit the Vegetation Information System (VIS) database. c. Use the VIS to determine whether the % cleared status of the PCTs identified through field work on the land is above 70%. d. Map all PCTs on the land with the % cleared above 70% as HEV.	PCT 1646 – *Smooth-barked Apple – Blackbutt- Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – 45% cleared, therefore not a HEV. PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* – 68% cleared, therefore not a HEV. PCT 1737 – *Typha Rushland*– 70% cleared, therefore not a HEV. PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast* – 81% cleared, therefore **is a HEV.** Refer to Ground truthed vegetation **Figure 12** whereby 0.007ha of high conservation value will be impacted within PCT 1728.

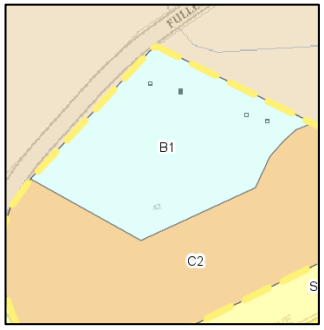
High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
2.2 Vegetation in over-cleared landscapes (Mitchell landscapes)	a. Identify over-cleared Mitchell landscapes by viewing map data from the SEED Portal – selecting NSW (Mitchell Landscapes) – latest version, selecting Show on Seed Map and viewing the View Over Cleared Land Status. b. Map all native vegetation on the land as HEV if it is in an over-cleared Mitchell landscape.	Threshold for over-cleared is greater than 0.7 Mapped as Sydney – Newcastle Barriers and Beaches landscape. Estimate fraction cleared: 0.5 therefore not over-cleared and Not HEV.  **Mitchell Landscape distribution for the site ex SEED**
2.3 Threatened Ecological Communities - any vulnerable, endangered, or critically endangered ecological community listed under the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* or the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* and not mapped on the Biodiversity Values Map	a. Identify Plant Community Types (PCTs) on the land through field work. b. Register and visit the VIS database. c. Use the VIS to determine whether the PCTs on the land have Threatened Ecological Community (TEC) Status. d. If not *identified* as a TEC from steps a – c above, then refer to the NSW Threatened Species Scientific Committee determinations, schedules 4, 4A and 5 of the FM Act, and the EPBC Protected Matters Search Tool to consider whether the any of the PCTs accord with the determinations. a. Map all PCTs on the land that are TECs as HEV.	This requires all listed TECs within the region or study area to be listed, and then mapped. An assessment of condition may be appropriate, dependent on the TEC identified, and areas not in moderate-good condition or highly disturbed may be excluded from the mapping. PCT 1646 – *Smooth-barked Apple – Blackbutt- Old Man Banksia woodland on coastal sands of the Central and Lower North Coast* – no associated TEC, therefore not a HEV. PCT 1717 – *Broad-leaved Paperbark – Swamp Mahogany – Swamp Oak - Saw Sedge swamp forest of the Central Coast and Lower North Coast* – was considered to be commensurate with the State listed TEC; Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions and is also considered be commensurate with EPBC listed TEC; Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland for the 0.46ha in poor condition, VIS of 35.5 therefore not a HEV under this HEV assessment although has been included in BDAR and BAMC as a TEC. PCT 1737 – *Typha Rushland– This community forms part of the Endangered Ecological Community* (EEC) Freshwater wetlands on coastal floodplains of the NSW North Coast/Sydney Basin and South East corner bioregions for 0.27ha in moderate condition, **therefore is a HEV.**

High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
		PCT 1728 -*Swamp Oak - Prickly Paperbark - Tall Sedge swamp forest on coastal lowlands of the Central Coast and Lower North Coast*– This community forms part of the Endangered Ecological Community (EEC) Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin, and South East Corner Bioregions for 0.007ha in moderate condition, **therefore is a HEV.** Of the 6.86ha Study Area, 0.277ha of the 2.46ha Subject Site are TEC's and therefore considered HEV. This is equivalent to 11.2% of the Subject Site and 4% of the Study Area being impacted, **Refer Figure 4** in BDAR for ground truthed vegetation
2.4 100m buffer on Coastal Wetlands and Littoral Rainforest areas as per the State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021	a. Locate the land on the SEPP (Resilience and Hazards) Maps b. Map any parts of the land shown as proximity areas for Coastal Wetlands and Littoral Rainforest as HEV.	No parts of the Study Area fall within the Proximity to Coastal Wetlands and Littoral Rainforest Area, or Coastal Use Area but does fall within the Coastal Environment Area Mapping according to the SEPP Coastal Management (2018) as shown on the SEPP Resilience and Hazards 2021 Land Application Map. Not mapped as proximity area, therefore not a HEV.  **Coastal Environment Area Map over Subject Site Ex NSW Planning Portal Spatial Viewer** Refer **Appendix G** of BDAR under State Environmental Planning Policy (Resilience and Hazards) 2021

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method	Project Comment
Criterion 3. Threatened species			
3.1 Key habitat for threatened species (vulnerable, endangered, or critically endangered species listed under BC Act)	Key breeding habitats with known breeding occurrence	a. Search BioNet for threatened species records on and within 5km of the land b. Undertake field work to identify potential breeding habitats on the land for threatened species. c. Either assume breeding occurrence and map identified breeding habitats on the land as HEV or undertake targeted surveys during the breeding season and map theses habitats as HEV if breeding occurs there.	A 5km BioNet record search was undertaken and a 1500m buffer mapped and shown in **Figure 5**. Fieldwork has been completed for targeted surveys for threatened species known to be present or predicted to occur within the Study Area. Threatened flora species survey effort is shown in **Figure 7** and threatened fauna species survey effort is shown in **Figure 8**. The location of threatened species records observed on site or known from BioNet records is shown in **Figure 5.** The relevant species polygons as per the Threatened Biodiversity Data Collection is shown in **Figure 10 for** Southern Myotis and assumed presence polygon **Figure 11** for Common Planigale. Key breeding habitats with known breeding occurrence was not confirmed, only assumed, therefore, it has to be **considered a HEV.** Common Planigale shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. Southern Myotis generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage. Within the mapped areas (as indicated below) of PCT 1737 & 1717, its highly unlikely that key breeding for either of this species would occur.  **PSC HBV/HEV mapping query**

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method	Project Comment
	Core Koala Habitat	a. Check council records for approved comprehensive or individual property Koala Plans of Management (KPoM). b. Identify areas of core koala habitat on the land mapped in any approved KPoM and map these areas as HEV. c. If there are no approved KPoMs, then undertake field work in accordance with the relevant State Environmental Planning Policy (SEPP) for koalas, e.g. SEPP (Koala Habitat Protection) 2020, to determine whether Core Koala Habitat is present on the land. d. Map any core koala habitat identified on the land through field work as HEV.	A mapped under Port Stephens Comprehensive Koala Plan of Management (PSCKPoM). The assessment in accordance with both the EPBC Act and PSCKPoM showed that the site does not contain core koala habitat as there are no areas of Preferred Koala Habitat or defined Habitat Buffers are mapped within the Subject Site or within the Study Area. Fieldwork completed also confirmed this and the site does not meet the definition of Core Koala Habitat as per Koala Habitat Protection 2020., therefore <u>not a HEV</u>.  **CKPoM Port Stephens Koala Habitat mapping for the Study Area indicating 'Supplementary Koala Habitat' & 'Mainly cleared land** **Refer Appendix G** of the BDAR under State Environmental Planning Policy (Biodiversity and Conservation) which includes 2021 Port Stephens Comprehensive Koala Plan of Management Assessment

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method	Project Comment
	Habitat for known populations of species-credit-species and SAII entities (species-credit species and SAII entities are identified in the Threatened Biodiversity Data Collection)	a. Search BioNet for threatened species records on and within 5km of the land. b. Undertake field work to identify populations of threatened species credit species on the land and their habitats. c. Map all habitats of known populations of species credit species on the land as HEV. The Biodiversity Assessment Method and the Department's survey assessment guidelines should be referred to for suitable habitat assessment methodologies. If a recent Biodiversity Development Assessment Report has been prepared for the land, then this could be referred to in support of demonstrating how this criterion has been considered.	A Biodiversity Development Assessment Report has been undertaken for the Subject Site. A 5km BioNet record search was undertaken and a 1500m buffer mapped and shown in **Figure 5.** Fieldwork has been completed for targeted surveys for threatened species known to be present or predicted to occur within the Study Area and a BDAR. Threatened flora species survey effort is shown in **Figure 7** and threatened fauna species survey effort is shown in **Figure 8**. The relevant species polygons as per the Threatened Biodiversity Data Collection is shown in **Figure 10 for** Southern Myotis and assumed presence polygon **Figure 11** for Common Planigale for species-credit-species but there are no SAII species. HEV species polygons are shown in **Figures 10 & 11.**
	Key habitats for migratory species	a. Search BioNet for threatened migratory species records on and within 5km of the land. b. Undertake field work to identify habitats of threatened migratory species on the land. c. Map all habitats of threatened migratory species on the land as HEV.	No suitable habitat for migratory shorebirds and the site is not Important Areas mapped for such. The site does not provide any habitat of note for migratory species and a HEV layer is not appropriate.
Criterion 4. Wetlands, rivers, estuaries & coastal features of high environmental value			
4.1 Nationally important wetlands Note: Rivers and their riparian areas comprising HEV are included in the Biodiversity Values Map under HEV Criterion 1 as protected riparian land		a. Search the Directory of Important Wetlands in Australia for those occurring in NSW. b. Identify any nationally important wetlands listed in the directory that occur on the land and map these areas as HEV.	Subject Site is not BV Mapped and not listed as a Nationally Important Wetland however site is located within the Hunter catchment. The Hunter Estuary Wetlands Ramsar site is listed in the Directory of Important Wetlands in Australia. Within the BDAR it is noted that are no artificial dams or mapped hydrolines recorded within the Study Area. One (1) unnamed first order mapped hydroline is located approx. 3m north of the Subject Site that then runs into Fullerton Cove. Approx. 275m west of the Subject Site lays the Hunter Wetlands National Park. Site investigations indicate that the closest top of bank stream measurement **is within** 3m of the Subject Site and as such there will be VRZ encroachment within the Subject Site and a Controlled Activity Approval (CAA) will be required to be submitted with the Development Application as per the *Water Management Act*. The site does not contain Nationally Important wetlands and a HEV layer is not appropriate.

High Environmental Value (HEV) Criteria and Components	Property Scale HEV Identification Method	Project Comment
4.2 Vulnerable Estuaries and Intermittently Opening and Closing Lakes and Lagoons (ICOLLs)	a. Identify whether any vulnerable estuaries or ICOLLs occur on, or in the vicinity of, the land by reviewing the Maps. b. Map any vulnerable estuaries or ICOLLs that occur on, or in the vicinity of, the land as HEV.	The site not an estuary or an ICOLL and a HEV layer is not appropriate.
Criterion 5. Areas of geological significance		
5.1 Karst landscapes	a. Identify whether limestone outcrops or caves occur on the land. b. Consider any additional Karst landscapes that occur in the vicinity of the land, with reference to the NSW Government's Guide to New South Wales Karst and Caves and any other available karst mapping, such as karts maps associated with local environmental plans. c. Map any limestone outcrops or caves on the land and any other karst landscapes that occur in the vicinity of the land as HEV.	No limestone outcrops or caves occur in or proximate to the Study Area and a HEV layer is not appropriate.
5.2 Sites of geological significance included in the State Heritage Register or Heritage Inventory	a. Identify whether the land contains, or is in the vicinity of, the sites of geological significance listed in Annexure A. b. Map any sites of geological significance that occur on, or in the vicinity of, the land as HEV.	The Study Area is not included on the State Heritage Register or Registry Inventory for geological significance (refer **Annexure A** below) and a HEV layer is not appropriate.  **Aboriginal Cultural Significance Map (Ex ePlanning Spatial Viewer) and current known areas as investigated**

Annexure A: Sites of geological significance included in the State Heritage Register or Heritage Inventory

Local Government Area	Name	Location
Canterbury Bankstown	Enfield Brickpits	7 Juno Parade, Greenacre
Cessnock	Bow Wow Creek Gorge	Sandy Creek Road, Mulbring
Eurobodalla	Myrtle Beach - Wasp Head Coastal Area	Durras
	Melville Point	Red Hill Road, Tomakin
Goulburn-Mulwaree	Badgerys Lookout View	Tallong
Kiama	Bombo Headland Quarry Geological Site	Princes Highway, Bombo
Port Stephens	Seaham Quarry	Torrence Street, Seaham
Shellharbour	Bass Point Area	Bass Point Tourist Road, Shellharbour
Warrumbungle	Narangarie Quarry Geological Site	Narangarie Road, Coolah
Uralla	The Captain Thunderbolt Sites – Thunderbolt's Rock	New England Highway, Uralla

WARWICK MUIR
Senior Ecologist

0448 689 698 | warwick@andersonep.com.au | Newcastle NSW

ACADEMIC QUALIFICATIONS

- Bachelor of Science (Biology) – University of Newcastle, 2019
- Diploma of Arboriculture (AQF5), 2021
- International Society of Arboriculture (ISA) Tree Risk Assessment Qualification (TRAQ)

TRAINING & LICENCES

- NSW Class C Driver's Licence
- Provide First Aid HLTAID011
- NSW Construction White Card
- Level 1 Tree Access Systems certified

FIELDS OF COMPETANCE

- Tree Field Data Collection using Tree Visual Assessment methodology including species name, common name, Structure and Health condition, SULE, TPZ, SRZ, Landscape Significance, Retention Value and general notes as required for small and large - scale projects
- Tree stock and planting inspections for ecological rehabilitation works
- Construction supervision, certification and long-term Tree monitoring
- Preparation of Arboricultural Impact Assessment(s) and Tree Protection Plans as per AS4970:2009 for small and large – scale projects
- Tree Hazard assessments using ISA TRAQ assessment methodology
- Tree pruning specifications as per AS 4373 Pruning Amenity Trees, management and maintenance programs
- Tree root mapping
- 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

Frog Survey experience

- Newcastle University field excursion to Ash Island on the Hunter Estuary, assessing the aquatic habitat for the Green and Golden Bell Frog.
- Nocturnal survey throughout Newcastle Golf Course, looking for threatened frog species..
- 2055 Halloran GTF, GG, MF, WF
- 1910 Mardi Services GTF, GG, MF, WF
- 1973 Eden Estates, 20 hours (At least 10 different visits) – . GTF, GG, MF, WF (same species as Fullerton Cove). At least once each with experienced seniors; Natalie Black, Simon Purcell and Ian Benson.
- Bundanoon
- Multiple Jensen/ Johns Rd Jobs GTF, GG, MF,
- 3302 Teralba GTF, GG, MF, WF
- 1898 Wallabi Pt MF, WF

- 2207 Pheasants nest
- 2208 Eastern Creek
- 2274 Wyee Wonderland GTF , MF, WF
- 2390 Anna Bay

PROFESSIONAL EXPERIENCE

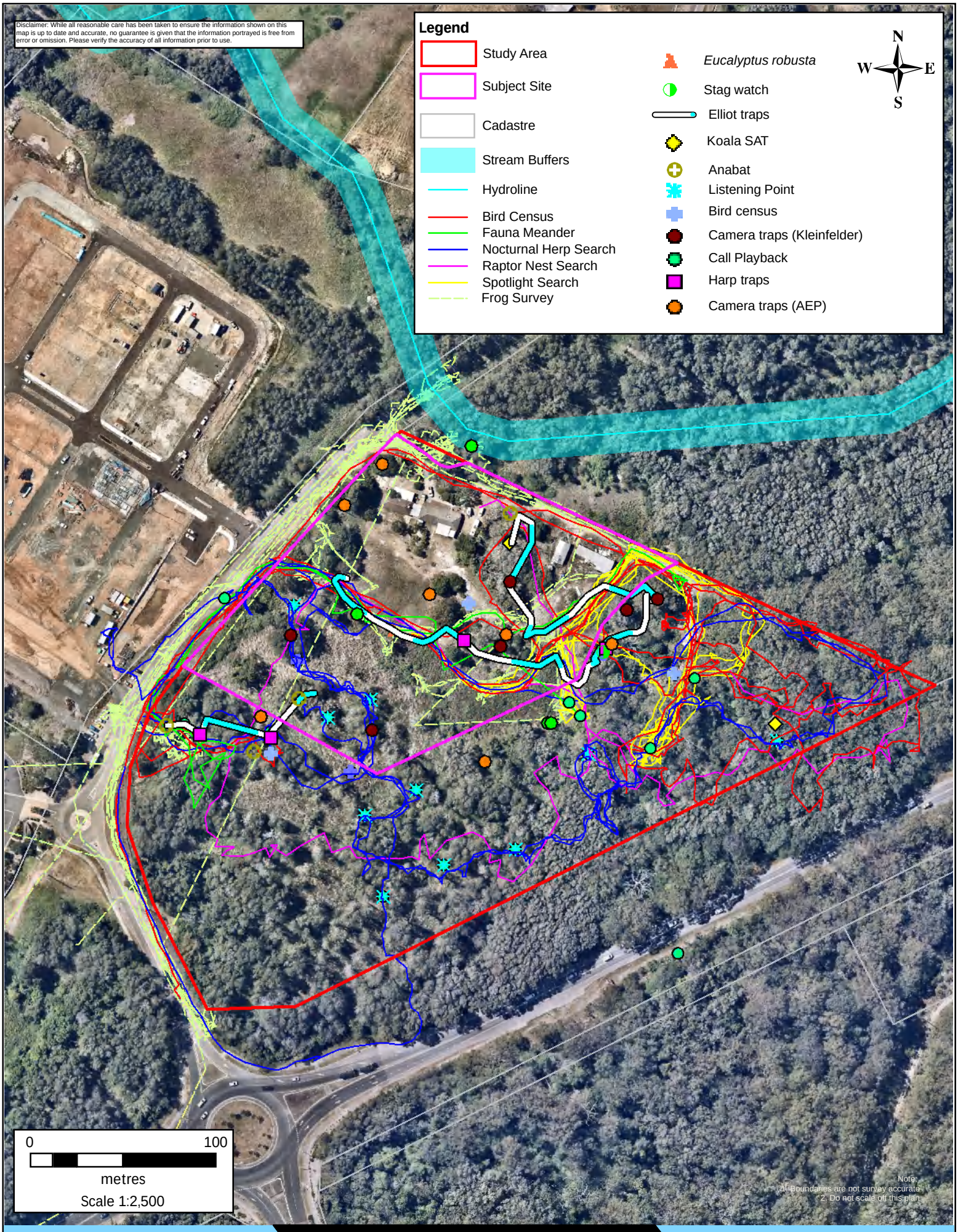
Ecologist/ Arborist (AQF5) 2020 – Present
Anderson Environment & Planning
Newcastle NSW

ECOLOGICAL EXPERIENCE

- Bush Regeneration Volunteer

Newcastle Landcare

- Field data collection for environmental Honours and PHD candidates in various locations



AEP

Figure 8 - Fauna survey effort

Date: February 2024

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS Ref: 36338

Client: Monteath and Powys

AEP Ref: 3063

AEP

Figure 11 - Common Planigale areas

Date: Feb 2024

Location: 42 Fullerton Cove Road, Fullerton Cove NSW

BOAMS: 36338

Client: Monteath and Powys

AEP Ref: 3063

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
7,957m²

LETTABLE / NET FLOOR AREA (NFA)
RETAIL 01-04 + MALL + LIQUOR + SUPERMARKET
= 7,528m²

CAR PARKING
280 x PUBLIC SPACES
6 x ACCESSIBLE SPACES
67 x STAFF SPACES
TOTAL = 353 SPACES

CONCEPT DESIGN

N

SITE PLAN
1:500 @ A1

14311 - SK - A02 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

CONCEPT DESIGN

N

GROUND FLOOR PLAN

1:200 @ A1

14311 - SK - A03 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
7,693m²

LETTABLE / NET FLOOR AREA (NFA)
RETAIL 01-04 + MALL + LIQUOR + SUPERMARKET
= 7,199m²

CAR PARKING
279 x PUBLIC SPACES
6 x ACCESSIBLE SPACES
67 x STAFF SPACES
TOTAL = 352 SPACES

BOUNDARY
SERVICE ENTRY
STAFF PARKING 67 SPACES
TRUCK MANOEUVERING AREA
24m BUSHFIRE APZ
TROLLEY STORE
LOADING DOCK
DIRECT TO BOOT
B1-E2 LAND ZONE BOUNDARY
PROPOSED RETAIL DEVELVOPMENT
BFA = 7,693 m²
BOUNDARY
TROLLEY BAYS
CROSSING
ENTRY
EXIT
FORECOURT
FULLERTON COVE ROAD
CARPARK
285 SPACES
24m BUSHFIRE APZ
B1-E2 LAND ZONE BOUNDARY
BOUNDARY

CONCEPT DESIGN

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SITE PLAN
1:500 @ A1

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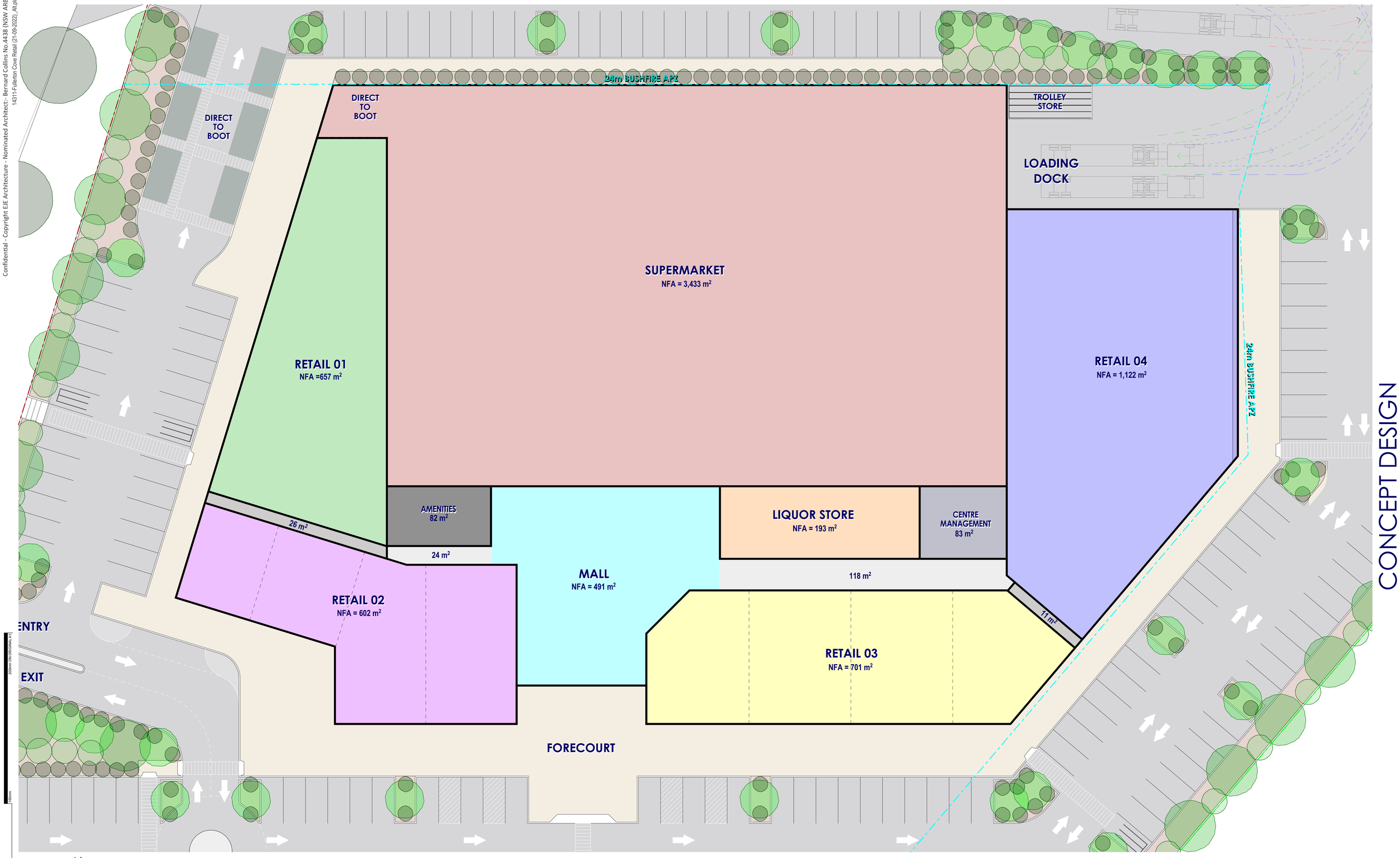
PROPOSED RETAIL DEVELOPMENT
42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture



GROUND FLOOR PLAN

1:200 @ A1

CONCEPT DESIGN

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PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
7,968m²

LETTABLE / NET FLOOR AREA (NFA)
RETAIL 01-04 + MALL + LIQUOR + SUPERMARKET
= 7,472m²

CAR PARKING
279 x PUBLIC SPACES
6 x ACCESSIBLE SPACES
67 x STAFF SPACES
TOTAL = 352 SPACES

CONCEPT DESIGN

N

SITE PLAN
1:500 @ A1

14311 - SK - A02 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

24m BUSHFIRE APZ

DIRECT TO BOOT

DIRECT TO BOOT

TROLLEY STORE

LOADING DOCK

SUPERMARKET
NFA = 3,433 m²

RETAIL 01
NFA =657 m²

RETAIL 04
NFA = 1,122 m²

24m BUSHFIRE APZ

AMENITIES
82 m²

LIQUOR STORE
NFA = 193 m²

CENTRE MANAGEMENT
83 m²

26 m²

24 m²

118 m²

11 m²

MALL
NFA = 521 m²

RETAIL 02
NFA = 719 m²

RETAIL 03
NFA = 827 m²

ENTRY

EXIT

FORECOURT
1,559 m²

CONCEPT DESIGN

N

GROUND FLOOR PLAN

1:200 @ A1

14311 - SK - A03 - 28/09/2022 - rev. A

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE architecture

REVISIONS LEGEND

- 01 NEW TREES & LANDSCAPING REMOVED FRO FLOOD ZONE
- 02 CAR PARKING SPACES REMOVED
- 03 CAR PARKING SPACES ADDED
- 04 KERB & RETAINING WALL ALIGNMENT REVISED
- 05 ACCESS GATES TO TELSTRA TOWER ADDED
- 06 FUTURE EV PARKING ADDED
- 07 KIOSK SUBSTATION RELOCATED & CAR SPACE REMOVED
- 08 TROLLEY BAY RELOCATED & CAR SPACE ADDED

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
6,992m²

LETTABLE / NET FLOOR AREA (NFA)
SUPERMARKET + LIQUOR STORE = 2,655m²
TENANCIES 01-05 = 2,343m²

TOTAL = 4,998m² (*REFER TO DRWG. A05)

GROSS FLOOR AREA (GFA)
TOTAL = 6,304m² (*REFER TO DRWG. A21)

CAR PARKING
12 x ACCESSIBLE SPACES (5.5 x 2.6m each)
5 x DIRECT to BOOT SPACES (5.5 x 3.0m each)
263 x STANDARD SPACES (5.5 x 2.6m each)

OVERALL TOTAL = 280 SPACES

16 x MOTORBIKE SPACES
10 x BICYCLES

DEVELOPMENT APPLICATION

N

DEVELOPMENT SITE PLAN

1:500 @ A1

14311 - DA - A04 - 27/06/2024 - rev. C

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE
Integrity
Innovation
Inspiration

24m BUSHFIRE APZ

SUPERMARKET
NON-TRADING AREA
1,085 m²

PLANT DECK OVER

CONDENSER DECK OVER

SUPERMARKET
TRADING AREA
2,485 m²

DIRECT TO BOOT
130 m²

DIRECT TO BOOT

COMMS
9 m²

MSR
18 m²

TROLLEY STORE

TENANCY BIN STORE

R/WATER TANK

LOADING DOCK

TENANCY 01
NFA = 413 m²

TENANCY 05
NFA = 70 m²

TENANCY 02
NFA = 459 m²

MALL
NFA = 367 m²

TENANCY 03
NFA = 553 m²

LIQUOR STORE
170 m²

AMENITIES
91 m²

TENANCY 04
NFA = 848 m²

24m BUSHFIRE APZ

FORECOURT
1,703 m²

N

GROUND FLOOR PLAN

1:200 @ A1

14311 - DA - A05 - 27/06/2024 - rev. C

PROPOSED RETAIL DEVELOPMENT

42 FULLERTON COVE RD., FULLERTON COVE

EJE Integrity Innovation Inspiration

DEVELOPMENT APPLICATION

Appendix E – Frog recordings

Attached to email in zip file

BIODIVERSITY | BUSHFIRE | ARBORICULTURE

NEWCASTLE SYDNEY

Workplace Health and Safety Policy

Anderson Environment and Planning (AEP) believes that the well being of our staff, and those affected by our work is a priority and must be considered during all work being performed on our behalf. People are our most important assets; and workplace health and safety (WHS) is everyone's responsibility.

Most of the work undertaken by AEP has inherent risk, including driving to and from site, fieldwork in adverse weather conditions, working in a natural environment both during daylight hours and after dark, and working off track and/or in remote locations. We prioritise a safe and healthy work environment and strive for continuous improvement in our safety practices. This policy outlines our commitment to maintaining high standards of work health and safety across our business.

Commitment to Work Health and Safety

Leadership

- AEP's Management and Coordinator team with the WHS Committee and members are committed to providing leadership and support in implementing effective WHS practices.
- AEP has allocated resources, established clear responsibilities, and fostered a culture of safety throughout the organisation.
- Managers and Coordinators are to ensure employees and others undertaking work are supervised and receive instruction, information and training necessary to perform their duties.

Consultation and Participation

- AEP encourages open communication and active participation of all employees (including subcontractors and volunteers) in WHS matters.
- Employee input is valued and feedback is sought after to identify potential hazards and implement suitable control measures.
- AEP is committed to adopting a preventative and strategic approach to work, health and safety, and using measurable targets to monitor performance.
- AEP is committed to promoting dignity and respect within the workplace, and taking action to prevent and respond to bullying.

Risk Management

- AEP prioritises the identification, assessment, and control of workplace hazards and risks.
- AEP has implemented risk management processes and guidelines to prevent accidents, injuries, and illnesses, and ensure compliance with relevant WHS legislation and standards.
- Employees are responsible for complying with reasonable instruction or lawful direction including wearing personal protective equipment and clothing supplied by AEP as required.

Training and Competence

- AEP is committed to providing appropriate training, education, and resources to employees and contractors to enhance their skills and knowledge in WHS matters.
- AEP will ensure that employees and others undertaking work are competent to perform their assigned tasks safely and effectively.
- Employees and others undertaking work are to take reasonable care for the health and safety of themselves and those under their supervision.

Compliance with Legislation

Legal Requirements

- AEP complies with all applicable WHS legislation, regulations, and codes of practice as outlined within the Work Health and Safety Act 2011 (NSW) and Work Health and Safety Regulation 2017 (NSW).
- Our operations meet the minimum requirements specified by relevant authorities, ensuring a safe and legally compliant work environment.
- While AEP has the primary duty of care, all employees have the responsibility while undertaking their duties to follow reasonable instructions and lawful directions in accordance with AEP's policies and procedures.

Incident Reporting and Investigation

- AEP have established an incident reporting system to report and investigate all work related incidents, hazards, injuries, and near misses.
- Managers and Coordinators are responsible for ensuring workplace incidents are reported and investigated. They are to ensure appropriate action is taken to prevent similar incidents from occurring in the future and provide support where required.
- Employees and others undertaking work are responsible for reporting incidents and hazards to their manager and/or WHS Committee, and participating in discussions regarding prevention.

Communication and Training

- AEP communicates WHS policies, procedures, and guidelines to all employees, students, volunteers, contractors, and stakeholders.
- Employees and others undertaking work are expected to engage with training and follow instruction provided to them by AEP to ensure their understanding and compliance with WHS requirements.
- AEP are committed to the effective implementation of this Work Health and Safety Policy and will allocate the necessary resources to ensure its success.
- This policy applies to all personnel involved in our operations and will be reviewed periodically to ensure its ongoing relevance.

Anderson Environment and Planning
March 2024

AEP Generic SWMS	Job No

AEP Job No		Project	
Client		Site Location	
Site Contact		Mob	
AEP Job Leader			
Description of works	• Generic Fieldwork including site walkover, equipment deployment, BAM methods and Arb assessments. • Travel to and from site • General site features and hazards • Driving on-site (4WD Conditions)		
SWMS implementation, monitoring and review	1. Brief each team member on the SWMS before commencing work. Ensure each team member knows work is to stop if the SWMS is not followed. 2. Observe the work being carried out and monitor compliance with the SWMS and review risk controls regularly, including: • before a change occurs to the work itself, the system of work or the work location • if a new hazard associated with the work is identified • when new or additional information about the hazard becomes available • when a notifiable incident occurs in relation to the work • when risk controls are inadequate or the SWMS is not being followed 3. In all of the above situations, stop the work, review the SWMS, adjust as required and re-brief the team.		

Plant and Equipment	**Vehicle Check Completed** ☐	**Inspection/maintenance**	**Pre-operation and Equipment Checklist** ☐

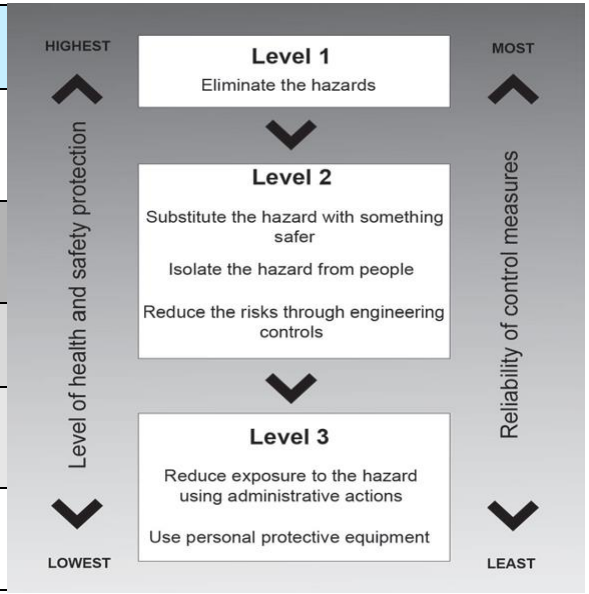
Approvals/Permits/Certificates required (Insert ☒ where required) & attach records	Site Induction ☐	Toolbox meeting record ☐

Personal Protective Clothing and Equipment ☒ where required (add additional requirement)		
☐ Safety steel cap footwear must be worn at all times in work areas.	☐ A hard hat must be worn	☐ High visibility clothing must be worn. No loose clothing.
☐ Hearing protection must be worn when using this machine.	☐ Gloves must be worn (unless it is unsafe to do so - demonstrated by a risk assessment).	☐ Long and loose hair must be contained.
☐ Safety glasses must be worn when there is a risk from airborne contaminants, e.g. dust.	☐ A dust mask or ☐ Respirator (depending on the hazard) must be worn when hazardous substances are present.	☐ Sunscreen and wide brim hat must be worn to protect against ultraviolet radiation.
☐ Long sleeve shirt and pants or overalls required.	☐ Adequate water and food must be taken.	☐ Ready access to fully-stocked first aid kit including snake bandages.

Qualification, Licence/Certification, Training, Competence, and Experience Required of Personnel	
Fieldwork Supervisor Name:	**Other Fieldwork Personnel Names:**
• Bachelor of Science or related field • Relevant Training and experience for activity undertaken • Vehicle Licence relevant to vehicle driven (Manual, etc.) • General Induction for Construction Work Certificate • First Aid Training	

Applicable legislation & Codes of Practice (COP)	
NSW Work Health & Safety Act 2011 Work Health & Safety Regulations 2017	**COP** • How to Manage WHS Risks • First Aid in the Workplace

WHS Risk Assessment Matrix	***PROBABILITY*** ***HOW LIKELY IS IT TO HAPPEN?***			
CONSEQUENCE HOW BAD COULD IT BE?	A. Highly likely: could occur at any time	B. Likely: could occur sometime	C. Unlikely: could occur, but very rarely	D. Very unlikely: could occur, but probably never will
1. Kill or cause permanent disability or ill health	**1**	**2**	**4**	**7**
2. Long term illness or serious injury	**3**	**5**	**8**	**11**
3. Medical attention and several days off work	**6**	**9**	**12**	**14**
4. First aid needed	**10**	**13**	**15**	**16**



RISK RATING	
1-3	**Critical Risk –** Immediate action is required. The activity must not proceed and an alternative safer method of work is required or additional controls must be implemented to reduce the likelihood and/or consequence.
4-6	**High Risk –** Important to act on this very soon. The activity must not proceed, review the risk controls based on the hierarchy of controls and add additional controls to reduce the risk level. A documented system of work including standard operating procedures, training, monitoring and supervision is required. Continued exposure would only be considered in exceptional circumstances, the decision to do so should be made at Principal Level after due consideration of cost versus benefit. Any decision to continue the exposure to the risk must be subject to continuous review.
7-10	**Medium Risk –** Risk control measures are required. Exposure to the risk may continue provided it has been appropriately assessed, has been mitigated to As Low As Reasonably Practicable (ALARP), and is subject to periodic review to ensure the risk does not increase.
11-16	**Low Risk –** Action taken when possible/manage by procedures. Exposure to the risk is acceptable, but is subject to periodic review to ensure the risk does not increase.

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
1	Site preparation	Consider equipment needed and environmental factors such as weather, site condition, etc.	**12**	Check weather report and site condition when preparing for site work. Bring appropriate equipment, including full-stocked, up-to-date first aid kit.	16	Fieldwork Supervisor	
2	Road Safety during travel to, from site and within unformed terrain within site.	Collision with other vehicles, road hazards or pedestrians. Loss of control of vehicle, disobeying traffic laws and signs.	**4**	Drive to the conditions of the road, and according to speed limits, signs and traffic regulations. Driver alert, and not fatigued or distracted by other passengers or mobile phones. Driver qualified with relevant license and ability. Seatbelts worn and equipment secured.	4	Fieldwork Supervisor	
		Driving 4wd vehicles on unsealed roads. Changes in slope, mud, dust, potholes, wash-outs, wet conditions, sudden changed road conditions resulting in injury to person or damage to vehicle. Can cause the vehicle to lose traction, become stuck or overturned.	**7**	Reduce speed to minimum, maintain attention, when in doubt walk, wear seat belts, secure equipment in vehicle. Do not drive across slopes or through water bodies with any safety risk. Ensure personnel are fit for work, Slow down and always drive to road conditions. Key control being speed reduction to suit road conditions and visibility. Ensure all people in vehicle are wearing their seat belts correctly. Select 4WD when conditions require	7	Fieldwork Supervisor	
		Passing on-coming traffic/interacting with other vehicles, other 4wd vehicles, heavy equipment, trucks, and motor bikes. Head on collision due to bad dust conditions and poor visibility.	**7**	Slow down. Keep to the left, lights on. If visibility is poor due to heavy dust or rain, pull right off the road where visibility allows.	7	Fieldwork Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
		Overtaking or being overtaken. Poor visibility resulting in road accident.	**8**	Have good visibility, lights on and keep right (when overtaking). Ensure positive communication between you and other staff. Slow down and keep to the left (when being overtaken).	8	Fieldwork Supervisor	
		Animals on the road. Causing accidents especially at dawn or dusk.	**7**	Beware of what type of animals to expect and reduce speed when animals are prevalent in area. Warn other people in the vehicle to look out for animals. Always remain aware during dawn and dusk.	7	Fieldwork Supervisor	
		Long periods of driving. Driver fatigue resulting in road accidents.	**7**	Have more than one driver and /or have regular breaks. Ensure drivers are fit for task, not distracted or fatigued. Passenger to monitor for signs of fatigue or distraction, and navigate for driver.	7	Fieldwork Supervisor	
		Driver experience may be inadequate, or vehicles may be faulty, which can pose risk to life.	**7**	Ensure experienced drivers are used to control the 4wd vehicles. Vehicles have inspection completed before they leave the Environment compound and defects, which could affect the safe operation of the vehicle, are rectified before commencing the trip.	7	Fieldwork Supervisor	
		Vehicle breakdown or malfunction resulting in accident or lost time.	**15**	Light Vehicle checklists to be completed on a weekly basis. Do daily vehicle walk around inspections. Any vehicle issues notify – relevant personnel and take action for non-compliant vehicle faults according to fault category.	16	Fieldwork Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
		Strains to back and neck, uncontrolled movement of people inside vehicle	**12**	Ensure everybody wears seatbelts. Observe speed limits and drive to prevailing road and weather conditions. Navigate with aid of maps and GPS. Slow down at intersections and prepare to give way. Engage 4WD if necessary (ensure hubs are locked) Stop vehicle off the road and rest if drowsy and/or fatigued.	14	Fieldwork Supervisor	
3	Traversing across the site on foot	Trip or slip injury due to not wearing appropriate footwear. Overuse injury due to inadequate shoe support.	**12**	Wear enclosed, safety walking boots, with adequate support and longevity. Shoes preferably should provide ankle support.	14	Fieldwork Supervisor	
		Vehicle impact on person walking on foot	**7**	Clear, positive communication with nearby work parties. Work in pairs and communicate vehicle sightings or nearby activities that could impact the work being undertaken.	7	Fieldwork Supervisor	
		Unseen objects on the ground, uneven surfaces (Slips, trips and falls hazards), grazes and cuts	**9**	PPE Long pants, long sleeves, boots and safety glasses, gloves if necessary. Plan movements in advance to avoid need to hurry. Tread carefully, keep watch for sudden drops, mounds and general ground habitat features e.g.) Warrens and Holes.	12	Fieldwork Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
		Encounters with animals, esp. pigs and cattle	**15**	Be vigilant and ready to react, e.g. Climb tree or retreat to vehicle. Return to vehicle if site is unsafe due to aggressive or territorial animals present. Clear communication with other team members if feral animals are present.	15	Fieldwork Supervisor	
		Bites and stings (snakes, spiders, ants, scorpions and centipedes. Mosquitoes and sand flies)	**5**	PPE Long Pants, Long Sleeves, Safety glasses, snake gaiters and gloves if required. Insect repellent as required. Ensure all employees are aware of first aid kit location and first aid personnel. Carry snake bandages when long distance from first aid kit.	8	Fieldwork Supervisor	
		Falling limbs from trees	**7**	Ensure all personnel are aware of risk and take extra care when working in areas after fire or heavy machinery has been through. Be alert during periods of high winds. Ensure all employees are aware of first aid kit location and first aid personnel. Wear hard hat if risk is moderate. Stay out of fall zone of at risk trees or limbs e.g. standing dead stags or overhanging limbs stuck in tree crown. Communicate this risk to other team members.	7	Fieldwork Supervisor	
		Traversing steep slopes or cliff areas by foot. Fall injury due to inattention and traversing without safety lines/harness	**7**	Maintain clear distance from crest of cliffs. Use approved safety lines/harness but only permitted after completion of appropriate training and with second person support. Maintain three point contact at all times.	7	Fieldwork Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
		Sun exposure	**10**	PPE Long pants, long sleeves, shady hat, sunscreen. Ensure all employees are aware of first aid kit location and first aid personnel.	13	Fieldwork Supervisor	
		Exhaustion and dehydration	**10**	Program long traverses to avoid hottest part of day. Take spot tracker, Satellite phone and UHF at all times to ensure emergency can be alarmed if required. Take frequent rest breaks and drink plenty of water. Seek shade when possible. Monitor other personnel for exhaustion signs. Ensure all employees are aware of first aid kit location and first aid personnel. Self-monitoring of urine colour/hydration levels	13	Fieldwork Supervisor	
		Disorientation, getting lost, losing track of time	**13**	When travelling more than 500m from vehicle: Take GPS co-ords of vehicle before departing. Ensure you have appropriate maps. Carry spare batteries for GPS Carry drinking water. If in an area of no service, take Satellite phone to ensure emergency can be alarmed if required.	15	Fieldwork Supervisor	
		Impaling on wire fences due to inattention	**15**	Use gates. Cross fence lines at corner strainer posts. Go under rather than over fence where possible.	15	Fieldwork Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
4	Crossing drainage channels and working within waterbodies	Becoming stuck or slipping, injury, hypothermia, drowning under flood conditions.	**4**	Use appropriate safety lines/ropes and have a second person accompanying for support. Wear appropriate wet gear such as waders and raincoat. Before entering a waterbody, e.g.) Dewatering supervision, assess depth and accessibility. Do not enter water of an unknown depth.	7	Fieldwork Supervisor	
5	Site work and Equipment installation	Physical strain – back, neck, legs	**9**	PPE Long Pants, Long Sleeves, Safety glasses and gloves. Use correct manual handling techniques (bend knees, carry at waste height). Get help from other team members as required (use two person lift). Separate gear into smaller more manageable portions. Utilise hiking packs to carry equipment, putting the weight on your hips using the hiking pack straps and keeping your hands free whilst traversing to maintain 3 points of contact where needed.	12	Fieldwork Supervisor	
		Injury from heavy machinery within a work zone	**4**	Maintain attention. Do not walk on machine operators blind side. Remain clear of machine work zone until signal is clear to move in.	7	Fieldwork Supervisor	
		Injury from loose metal and sharp parts attached to survey equipment such as drills, brackets, etc. Puncture, laceration, eye injury.	**12**	Wear appropriate eye PPE and gloves and check no sharp edges or loose nails are hanging from brackets before they are carried/transported.	15	Fieldwork Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
		Pinch points between device and tree	**13**	Be aware of the potential pinch points and red zones for fingers, always ensure that you wear gloves. Ensure that finger placement/hair/clothing is always away from rotating drill parts.	15	Field Supervisor	
		Drill kick back when installing and removing screws from tree	**10**	When drilling or removing screw into or from the tree, slowly depress the drill button and hold onto the drill with two hands. This will help to prevent the screw from catching in the tree and having the drill spin off the screw.	10	Field Supervisor	
		Snakes and stinging insects located under debris at the base of tree when clearing the area for a bait tube (snake bites or insect stings)	**8**	Select trees with less grass and debris at the base of the tree. Trees with debris or heavy grass at the base that have to be used, check thoroughly before clearing using a long stick to move debris from area and scare away any unseen animals. Use correct PPE, gloves, long pants, boots, gaiters if needed and carry a small first aid kit and snake bandages on person for an emergency.	11	Field Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
6	Fauna Handling	Bites scratches from captured animals.	**13**	Handling of elapid snakes is not permitted. Use appropriate techniques for species and situation. PPE Long Pants, Long Sleeves, Safety glasses, and gloves if required. Ensure all employees are aware of first aid kit location and first aid personnel Review first aid for snakebite prior to departure to site. Each team member to carry 2 x conforming bandages whilst away from camp. First Aid kit in vehicle at all times. Ensure all employees are aware of first aid kit location. All employees and contractors to have first aid competencies.	15	Field Supervisor	
		Minor bites and stings (spiders, ants, scorpions and centipedes)	**10**	PPE Long Pants, Long Sleeves, Safety glasses, snake gaiters and gloves if required. Use appropriate removal technique. Ensure all employees are aware of first aid kit location. All employees and contractors to have first aid competencies.	13	Field Supervisor	
7	Working in remote areas	Conducting field work in remote areas. Communication may be lost, causing confusion and distress. Little reception may prevent contact between team members.	**13**	Always carry phone and GPS. Advise supervisors of working location each day and if a change to a work plan/location is required during the day, contact the supervisor to let them know of the changes prior to moving to a new area.	15	Field Supervisor	
		Wildfires resulting in injury to person, smoke inhalation and potential death.	**7**	Familiarise yourself with the work location. Ensure that you are aware of wind conditions each day. Identify potential areas of refuge such as large clearings, riparian strips, swamps, rock outcrops or vine thicket.	7	Field Supervisor	

No.	Step/Activity	Hazard & Risks	Risk Rating	Control Measure (or Safe Work Procedure reference)	New Risk Rating	Action by	Comment
		Storms and Rain may interfere with GPS signal and equipment. Thunder & lighting may pose risk to personnel.	**15**	Remain aware of approaching storm activity during survey work. If large storm/lightning is approaching head to vehicle and travel to a cleared area if available.	15	Field Supervisor	
Other						Field Supervisor	
Other						Field Supervisor	

I, the undersigned, confirm that I have been consulted in this SWMS and its contents are clearly understood. I also confirm that my required qualifications to undertake this activity are current. I also clearly understand that the controls in this SWMS must be applied as documented, otherwise work is to cease immediately*. **(All staff conducting fieldwork on site at any time must date and sign below)***

NAME	SIGNATURE	DATE	EMPLOYER

AEP

BIODIVERSITY | BUSHFIRE | ARBORICULTURE

NEWCASTLE SYDNEY

Arborist Impact Assessment

Proposed Commercial Retail Development
Lot 14, DP 258848
42 Fullerton Cove Road, Fullerton Cove, NSW

Prepared for: Monteath & Powys

21 June 2024

AEP Ref: 3063.03

Revision: 02

Newcastle | Sydney
10 Darvall St Carrington 2294 | 275 Stanmore Rd Petersham 2049
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Executive Summary

At the request of the Monteath & Powys (the client), Anderson Environment & Planning (AEP) have prepared an Arborist Impact Assessment to address the potential arboricultural impacts from the proposed Commercial Retail Development (the Proposal) at 42 Fullerton Cove Road, Fullerton Cove, NSW (the Subject Site).

The arborist site survey was undertaken on 13 February 2024. Tree Assessment was undertaken by the following methodologies (**Section 4**);

- A visual tree assessment as described by Mattheck and Breloer (1994).
- Characteristic features for each tree were recorded;
- Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) using methods of calculation as outlined in AS 4970 – 2009.
- Landscape Significance Rating (LSR) and Retention Values as outlined by Morton (2006).

A total of six (6) trees identified within the site and surrounds were assessed. The condition of the assessed trees includes four (4) in good condition and two (2) in poor condition. (**Section 5.1**)

The following landscape significance ratings (LSRs) have been applied to the assessed trees (S**ection 5.2**);

- Six (6) 'High', due to their canopy size and good health and as representatives of the original vegetation of the area.

With consideration of the estimated life expectancy for each tree, Retention Values were assigned to each tree within the site. This identified the following;

- One (1) 'High'; and
- Five (5) 'Moderate' Retention Value Trees.

A total of one (1) assessed trees are proposed to be removed due to the development works (**Section 6.1, Table 3**), including;

- One (1) trees (Tree 1) which will have encroachment into the Structural Root Zone by the development footprint.

The remaining five (5) trees can be retained with Tree Protection Measures (**Section 6.1, Table 3**).

Document Control

Document Name	Arborist Impact Assessment for Proposed Commercial Retail Development at 42 Fullerton Cove Road, Fullerton Cove, NSW
Project Number	3063.03
Client Name	Monteath & Powys
AEP Project Team	Warwick Muir Joe Young Natalie Black

Revision

Revision	Date	Author	Reviewed	Approved
00	20/02/2024	Joe Young	Warwick Muir	Kelly Drysdale
01	22/03/2024	Joe Young	Warwick Muir	Kelly Drysdale
02	21/06/2024	Joe Young	Warwick Muir	Kelly Drysdale

Distribution

Revision	Date	Name	Organisation
00	20/02/2024	Jamie Graham	Monteath &Powys
01	23/03/2024	Jamie Graham	Monteath &Powys
02	21/06/2024	Jamie Graham	Monteath &Powys

Disclaimer

Direct observations are relevant only to the trees identified within this report. This report utilizes a rapid assessment of tree health and condition to inform retention value. This assessment of tree health and condition is based on non-destructive visual observations from ground level. Thus, it is not possible to identify all structural faults at high levels in the tree, internal structural faults or within the root system. Observations about Tree Health, Structure, and other characteristics have been made at the time of assessment and these characteristics may change over time due to natural growth of the tree as a living organism or due to unforeseen events. As such the observations that are supplied within are relevant for a period of 12 months from the time of assessment, after which re-assessment may be required for the trees assessed within this report. The recommendations and methodologies for Tree Protection within this report are relevant only to the Trees assessed within this report. The author is not responsible for tree damage related to failure to apply these recommendations or methodologies for Tree Protection in full within this report or for tree damage relating to works conducted by an unaffiliated person. No responsibility for damage to persons or property is accepted for damage by trees referred to within this report.

Contents

Tables

Figures

Appendices

1.0 Introduction

1.1 Background

At the request of the Monteath & Powys (the client), Anderson Environment & Planning (AEP) have prepared an Arborist Impact Assessment and Tree Protection Plan to address the potential arboricultural impacts from the proposed Commercial Retail Development and associated civil infrastructure (the Proposal) at 42 Fullerton Cove Road, Fullerton Cove, NSW (the Subject Site).

This report considers the Biodiversity Development Assessment Report (BDAR) undertaken for this development (AEP 2023).

1.2 Objectives

Further to the above the following objectives for this report have been assigned:

- Tree identification plan and schedule identifying tree species, size, canopy spread and other dimensions**;**
- Assessment of pre nominated trees within the Subject Site, including, but not limited to, the health and vigour of the trees, structural integrity, life expectancy, retention value and landscape significance;
- Likely impact the proposed development will have on assessed trees, including TPZ and SRZ encroachments; and
- Tree protection plan and methodologies throughout the development for all impacted trees to be retained.

2.0 Site Description and Locality

Table 1 provide the site details for the Subject Site.

Table 1: Site Particulars

Detail	Comments
Client	Monteath & Powys
Address	42 Fullerton Cove Road, Fullerton Cove, NSW
Title(s)	Lot 14, DP258848
Subject Site	The Subject Site (2.46ha) primarily consists of existing vegetation, with cleared areas and existing tracks throughout and residential dwellings in the north. The residential dwellings are accessed from Fullerton Cove Road, at the northern end of the Study Area. To the north west and south west of the Study Area land has been cleared for residential development. Bushland exists to the east and south. Between the south eastern border of the Study Area and Nelson Bay Road is a 50m stretch of bushland.
LGA	Port Stephens Council
Zoning	Subject Site is zoned E1 – Local Centre. C2 – Environmental Conservation; C2, Environmental Management.
Current Land Use	The land has been semi maintained around the residential dwelling and sheds.
Surrounding Land Use	To the north and west of the site land is zoned RU2 Rural Landscape. To the east and the south, land is zoned SP2 Infrastructure - Classified Road as it adjoins Nelson Bay Road and Fullerton Cove Road respectively.

Detail	Comments
Soil	The Subject site is within the Tomago Coastal Plain Soil Landscape, characterised by either Loose brownish black loamy sand topsoil—Bleached loose sand (shallow subsoil.) (eSpade, 2023).

3.0 Proposed Development

It is proposed to construct a Commercial Retail Development, associated civil infrastructure and Asset Protection Zone (APZ). It should be noted that the entirety of the Subject Site will be managed as an APZ.

Figure 1 depicts the extent of the Subject Site overlain on an aerial photograph of the locality.

Figure 2 shows a concept plan for the proposed development.

AEP

Figure 1 - Site Location

Date: February 2024

Location: 42 Fullerton Cove Road, Fullerton Cove, NSW

Client: Monteath & Powys

AEP ref: 3063.03

REVISIONS LEGEND

- 01 NEW TREES & LANDSCAPING REMOVED FRO FLOOD ZONE
- 02 CAR PARKING SPACES REMOVED
- 03 CAR PARKING SPACES ADDED
- 04 KERB & RETAINING WALL ALIGNMENT REVISED
- 05 ACCESS GATES TO TELSTRA TOWER ADDED
- 06 FUTURE EV PARKING ADDED
- 07 KIOSK SUBSTATION RELOCATED & CAR SPACE REMOVED
- 08 TROLLEY BAY RELOCATED & CAR SPACE ADDED

DEVELOPMENT SCHEDULE

BUILT FLOOR AREA (BFA)
6,992m²

LETTABLE / NET FLOOR AREA (NFA)
SUPERMARKET + LIQUOR STORE = 2,655m²
TENANCIES 01-05 = 2,343m²

TOTAL = 4,998m² (*REFER TO DRWG. A05)

GROSS FLOOR AREA (GFA)
TOTAL = 6,304m² (*REFER TO DRWG. A21)

CAR PARKING
12 x ACCESSIBLE SPACES (5.5 x 2.6m each)
5 x DIRECT to BOOT SPACES (5.5 x 3.0m each)
263 x STANDARD SPACES (5.5 x 2.6m each)

OVERALL TOTAL = 280 SPACES

16 x MOTORBIKE SPACES
10 x BICYCLES

PROPOSED RETAIL DEVELOPMENT
BFA = 6,992 m²
FL.2.900

FORECOURT
1,564 m²

CARPARK
280 SPACES

LOADING DOCK

TRUCK MANOEUVERING AREA

SERVICE ENTRY

ENTRY

EXIT

FULLERTON COVE ROAD

BOUNDARY

24m BUSHFIRE APZ

'E2' LAND ZONE

E1-E2 LAND ZONE BOUNDARY

DEVELOPMENT APPLICATION

N

DEVELOPMENT SITE PLAN
1:500 @ A1

14311 - DA - A04 - 19/06/2024 - rev. B+

PROPOSED RETAIL DEVELOPMENT
42 FULLERTON COVE RD., FULLERTON COVE

EJE Integrity Innovation Inspiration

4.0 Methodology

The arborist site survey was undertaken on 13 February 2024. Each tree observed within the Subject Site was assigned a unique tree number. Tree species were identified based on guidance from regional identification guides (Fairley and Moore 1989, Robinson 2003), and descriptions and records provided by the Royal Botanic Gardens (Plantnet 2022).

4.1 Visual Tree Assessment

A visual tree assessment to evaluate the health and condition of these trees in relation to the impacts of the proposed development was undertaken from ground level following the methodology described by Mattheck and Breloer (1994). Tree height was estimated following the guidance outlined in the Private Native Forestry Code of Practice (DECC 2007) and confirmed with a laser range finder. The Diameter at Breast Height (DBH) and Diameter Above Buttress (DAB) was determined using a DBH tape and methods of calculation for the Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) applied as outlined in Australian Standard 4970-2009 *Protection of trees on development Sites* (AS 4970 – 2009) (Standards Australia 2009). Tree Total Canopy Area was estimated from the formula Pi x (average canopy spread)^2.

4.2 Tree Retention Value

To determine tree Retention Value a Landscape Significance Rating (LSR) was assigned to each tree. The LSR value provides consideration of the trees amenity, environmental and heritage values (refer **Appendix B**). Trees are then assigned one of the following LSR categories:

- Significant (1);
- Very High (2);
- High (3);
- Moderate (4);
- Low (5);
- Very Low (6); and
- Insignificant (7).

Once the landscape significance value has been determined the following assessment matrix that utilises estimated life expectancy and landscape significance (**Table 2**) was applied to each tree.

Table 2: Tree Retention Status Matrix Assessment matrix adopted from Morton (2006).

Landscape significance rating							
Estimated Life Expectancy	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Greater than 40 Years	High						
15 to 40 Years			Moderate				
5 to 15 Years				Low			
Less than 5 Years					Very low		
Dead or Hazardous							

4.3 Limitations

This report utilises a rapid assessment of tree health and condition to inform retention value. Should a detailed assessment of tree structural health and condition be required a tree risk assessment report should be commissioned.

This assessment of tree health and condition is based on non-destructive visual observations from ground level. Thus, it is not possible to identify all structural faults at high levels in the tree, internal structural faults or within the root system. Should a detailed assessment for structural faults be required a tree risk assessment report should be commissioned.

Weather conditions such as extreme wind, storm activity, lightning as well as other events or disturbances independent of the proposed activities are unpredictable. Unforeseeable damage to trees may occur as a result of unpredictable or unplanned weather events or disturbances.

Tree identifications are based on identifying features (fruit, inflorescence, etc.) found during February and made at ground level from within the Subject Site.

The total canopy area for each tree utilised within this report is an estimation based on field observation of canopy spread and the true amount of canopy area may differ.

Tree identified within by this plan are located to GPS accuracy and there may be some minor discrepancy in the true location.

Impact assessment was based to limited concept design confined to identification of the approximate proposal footprint at the time of preparation of this report. Variation of this concept design will alter some of the recommendations and this report should be updated to reflect these changes.

5.0 Tree Assessment Results

A total of six (6) trees identified within the site, the trees assessed are positioned in close proximity of the boundary of the development footprint and C2 –zoned land. Observations were made for each assessed tree **(Appendix A).** Tree locations are shown in **Figures 3.**

5.1 Summary of Tree Condition and Characteristics

All trees assessed within the site are native species. The condition of the assessed trees includes two (2) in poor or dead condition and four (4) in good to fair condition.

Notable Trees within this grouping include the following:

- Tree 1 – *Melaleuca quinquenervia* (Broad Leaved Paperbark) is the largest assessed tree the area with multiple large leaders and extensive low (<4m) canopy branches within the subject site;
- Tree 2 - *Melaleuca quinquenervia* (Broad Leaved Paperbark) is a mature tree in good condition with hangers from a neighbouring dead tree;
- Tree 3 – *Eucalyptus robusta* (Swamp Mahogany) is an over- mature tree with a large central column of decay, multiple recent branch failures, the head of the tree has failed in the past leading to an asymmetric canopy. This tree is in poor structural condition with cavities and has associated borer attack;
- Tree 4 – *Melaleuca quinquenervia* (Broad Leaved Paperbark) is a mature tree in good condition;
- Tree 5 – *Melaleuca quinquenervia* (Broad Leaved Paperbark) is a mature tree in good condition; and
- Tree 6 – *Eucalyptus robusta* (Swamp Mahogany) is an over- mature tree impacted by borer attack, with a strangler fig that has established roots and is into the upper canopy with the high potential to dominate and suppress the original tree.

5.2 Summary of Landscape Significance and Retention Value

The following landscape significance ratings (LSRs) have been applied to the assessed trees;

- Six (6) ‘High’, due to their canopy size and as representatives of the original vegetation of the area.

With consideration of the estimated life expectancy for each tree, Retention Values were assigned to each tree within the site. This identified the following;

- One (1) ‘High’ Retention Value Tree; and
- Five (5) ‘Moderate’ Retention Value Trees.

The following habitat features were observed in the trees;

- Tree 1 was observed to have a bird’s nest in the western canopy; and
- Tree 3 has cavities and decay forming potential hollows in the trees structure.

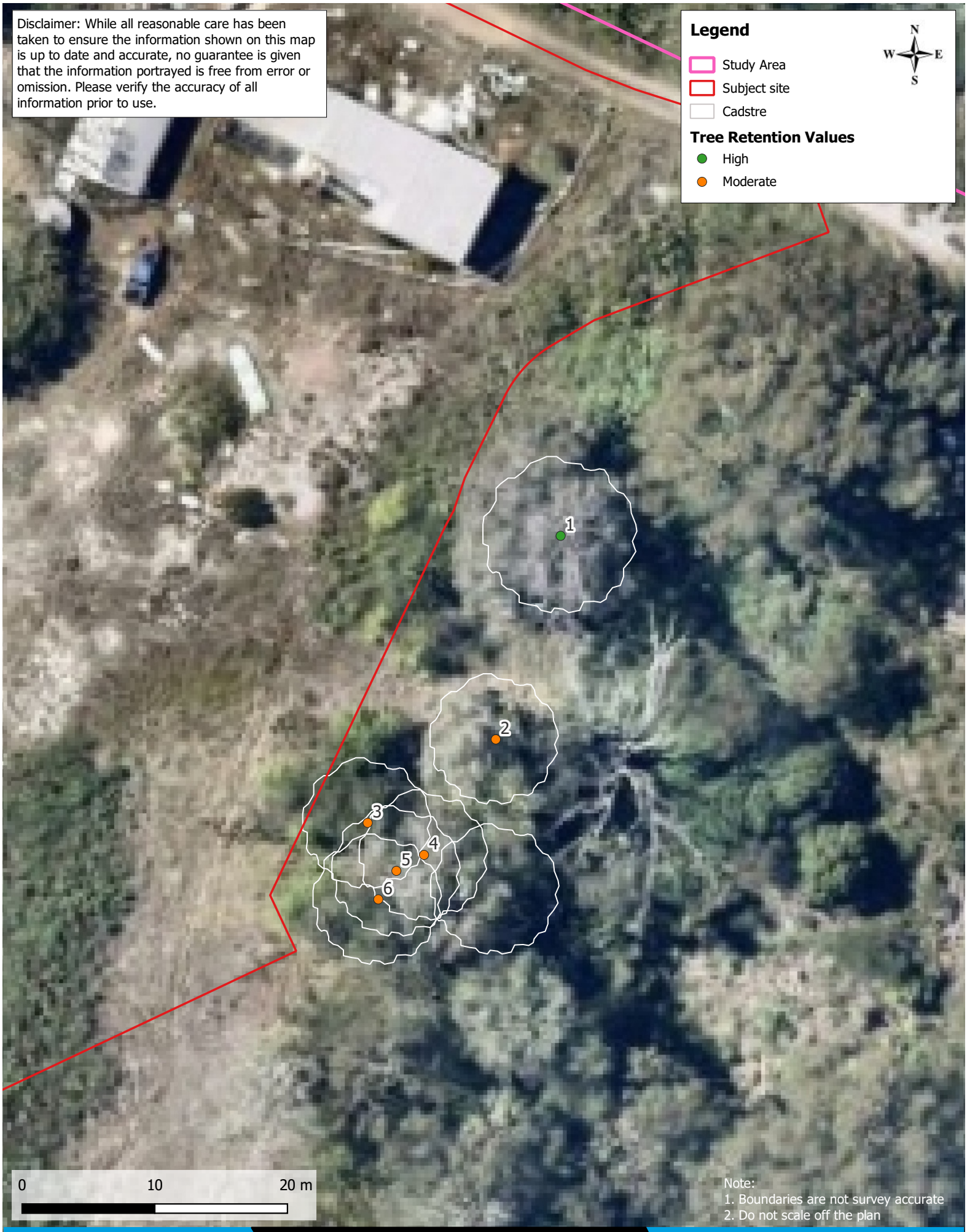

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Figure 3 - Tree Location & Retention Values

Date: June 2024

Location: 42 Fullerton Cove Rd, Fullerton Cove, NSW

Client: Monteath & Powys

AEP ref: 3063.03

6.0 Tree Impact Assessment

The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) are indicative areas critical for maintaining a tree's viability and stability respectively, holding the majority of the roots necessary for each function. Any ground works within these zones is likely to impact the viability or stability of the tree by injuring the root system.

6.1 Proposal Impacts

Upon review of the supplied proposal footprint, one (1) trees will require removal as these trees will be impacted by predicted structural root zone encroachment due to excavation (cut and fill) and retaining wall requirements for the construction of the adjacent bio-detention basin. These include:

- One (1) Moderate Retention Value Trees (Tree 1)

Impacts are unlikely to be mitigated through tree protection measures without major design changes, and tree stability and viability cannot be guaranteed. Of particular note is Tree 1, which will have ~50% of the SRZ impacted by the proposed retaining wall and detention basin. Furthermore, Tree 1 would require extensive pruning of the western canopy to access the site area, which will further impact this tree by unbalancing the canopy.

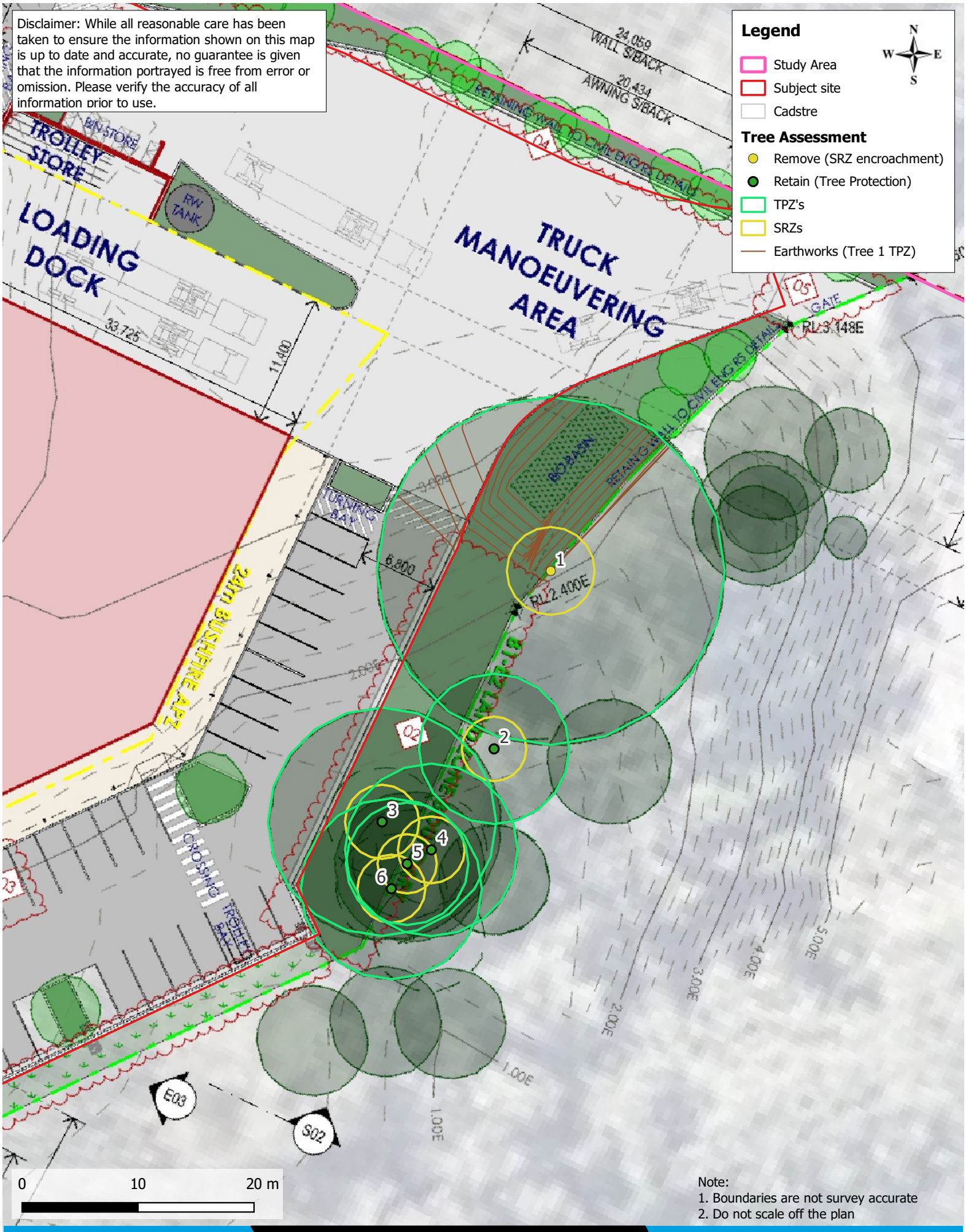
The remaining five (5) trees can be retained within close proximity to the development footprint. The following relates to tree protection for these trees;

- Tree 3 has TPZ encroachment by the development footprint of approximately 20%, this area will require excavation and compacted fill during the construction phase, however this tree has potential to be retained with the establishment of a tree protection zone and critical care to be taken during excavation in the vicinity of the tree structure and SRZ area. TPZ fencing as displayed in **Figure 5** will be required for the duration of works. If a TPZ fence is impractical for construction, additional protection measures must be applied in lieu of fencing. These include trunk and low branch guards, and ground protection measures installed as displayed in **Figure 5** following guidance in Australian standard AS 4970 – 2009 Protection of trees on development Sites (**Appendix D**). The use of "soft" construction methods including manual and vacuum removal of soils is recommended for ground works conducted within the TPZ of Trees to be retained.
    - It should be noted that this tree is in poor health and structural condition, and retention of this tree within close proximity to the development footprint could be hazardous to contractors and eventual site users. To mitigate this hazard, the western canopy of this tree should be reduced in weight, with branches that extend over the development footprint removed. All tree maintenance and pruning works should be carried out by a qualified tree worker in accordance with AS4373 –2007 Pruning of Amenity Trees.
- Trees 2 & 4-6 have minimal to no encroachment into the TPZ by the development footprint, and can be retained with minimal impacts to tree viability. These trees will require the establishment of a tree protection zone similar to the above points, with TPZ fencing as displayed in **Figure 5** will be required for the duration of works. If a TPZ fence is impractical for construction, additional protection measures must be applied in lieu of fencing. These include trunk and low branch guards, and ground protection measures installed as displayed in **Figure 5** following guidance in Australian standard AS 4970 – 2009 Protection of trees on development Sites (**Appendix D**). The use of "soft" construction methods including manual and vacuum removal of soils is recommended for ground works conducted within the TPZ of Trees to be retained.

Table 3 provides a summary of impact assessment.

Table 3 Summary of Impact Assessment

Tree Assessment	Retention Value (Tree No)			Total
	High	Moderate	Low	
Remove (TPZ/SRZ Encroachment)	Trees 1			**1**
Total Tree Removal	**1**	**0**	**0**	**1**
Retain (Protection, fencing)		Tree 2, 3, 4, 5, 6		**5**
Total Tree Retention	**0**	**5**	**0**	**5**



AEP

Figure 4 - Tree Assessment

Date: June 2024

Location: 42 Fullerton Cove Rd, Fullerton Cove, NSW

Client: Monteath & Powys

AEP ref: 3063.03

7.0 Recommendations

7.1 Tree Retention and Removal

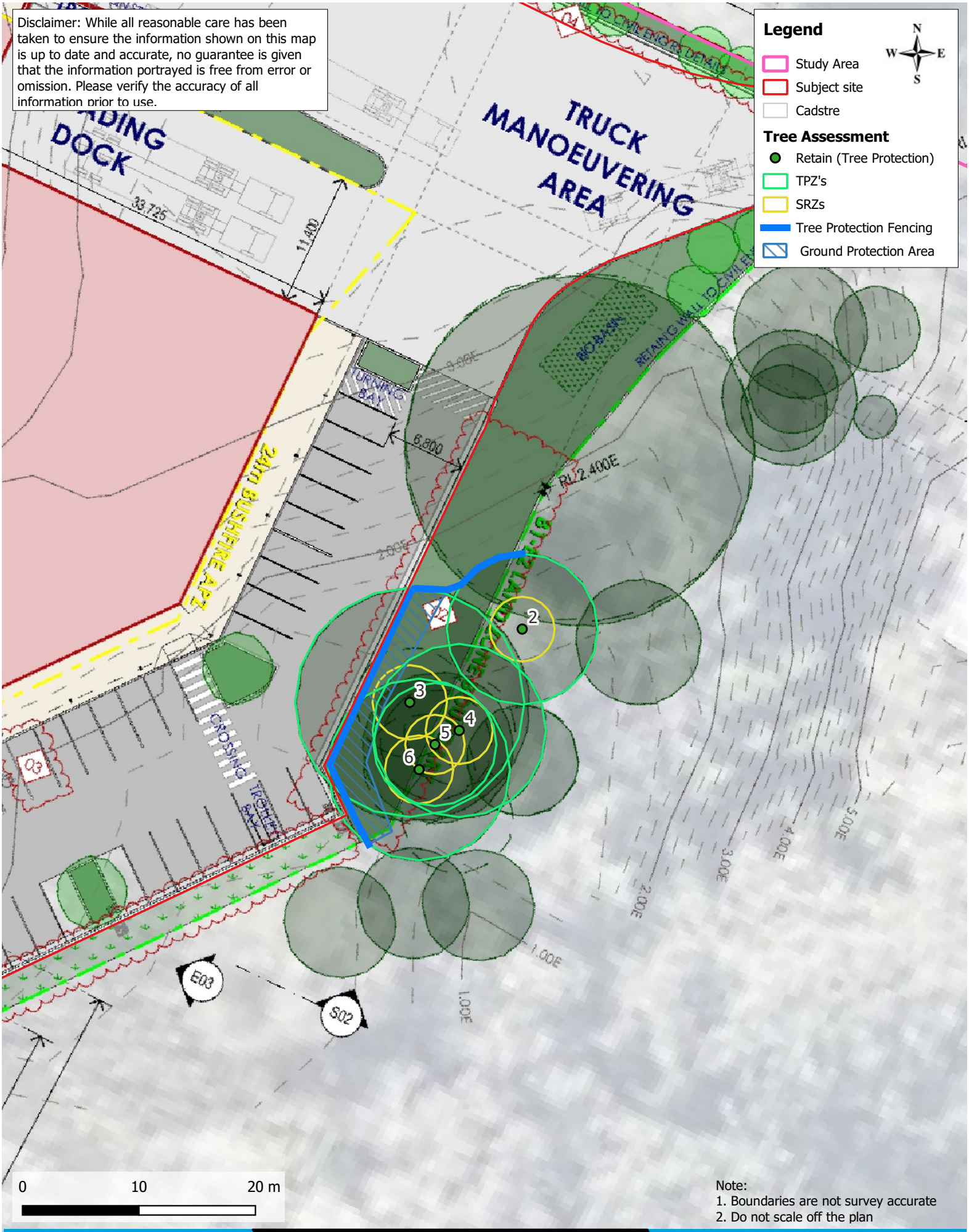
- Trees designated for removal within this report as outlined in **Section 6** should be removed by a qualified tree worker with appropriate professional liability insurance, and removed in a manner to prevent damage to retained trees.
- Trees designated for retention within this report as outlined in **Section 6** to the development footprint should be retained with Tree Protection Measures.

7.2 Tree Protection Measures

- All tree maintenance and pruning works should be carried out by a qualified tree worker in accordance with AS4373 –2007 Pruning of Amenity Trees.
- A continuous TPZ fence should be installed for retained trees as displayed in **Figure 5.** The TPZ shall be delineated by a 1.8m interlocking chain wire fence located around trees designated to be retained within close proximity to the Works, in accordance with AS 4687. **Appendix D** details tree protection fencing that should be implemented.
- TPZ fencing must be installed before the commencement of any Works. The fencing should not be removed or altered until after the completion of works.
- All Contractors working in close proximity to the TPZ of Trees to be retained should be briefed as to the requirements of the Tree Protection Zone.
- The TPZ fencing and zone should be certified by the project arborist before construction commences.
- Tree health and condition should be monitored by the project arborist at regular stages during construction, at practical completion of construction, and after completion.
- The following activities should be avoided within the TPZ of trees to be retained where practicable:
    - Machine excavation of soil including trenching;
    - Operation of heavy equipment;
    - Stockpiling of soils;
    - Storage of heavy or other equipment;
    - Parking of vehicles;
    - Wash down and cleaning of equipment;
    - Excavation for silt fencing;
    - Dumping of waste;
    - Change of soil level or gradient; and
    - Covering with concrete, impermeable, or compacted surfaces.
- Where works are required that encroach into TPZ of trees to be retained, additional protection measures, which include trunk and low branch guards, and ground protection measures should be implemented following guidance in Australian standard *AS 4970 – 2009 Protection of trees on development Sites* (**Appendix D**). These works should only be conducted under supervision of the project arborist. The use of “soft” construction methods including manual and vacuum removal of soils is recommended for works conducted within the TPZ of Trees to be retained.

7.3 Other Recommendations

- Clothing, equipment and boots should be clean and sanitised prior to each site visit to prevent onsite introduction of plant pests and diseases such as Myrtle rust.
- Vehicles and construction equipment should utilise designated entry and egress points to avoid potential of impacts on Trees to be retained.



AEP

Figure 5 - Tree Protection

Date: June 2024

Location: 42 Fullerton Cove Rd, Fullerton Cove, NSW

Client: Monteath & Powys

AEP ref: 3063.03

8.0 Conclusion

The recommendations for tree retention and removal have been made with consideration of minimising Arboricultural impacts.

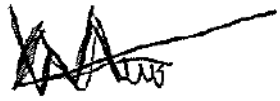
Based on the tree retention and removal proposed above the current proposal footprint will require the direct removal of one (1) of the assessed trees, while five (5) assessed trees can be retained requiring Tree Protection Measures including tree protection fencing.

Please note that assessment of tree removal and retention has been made with regards to a concept plan. These recommendations may be subject to change once further design and engineering detail has been prepared and this report will require updating in accordance with these changes.

The implementation of a detailed Tree Protection Plan and Tree Protection measures will be an essential part of the Construction Environment Management Plan to avoid further loss of trees in close proximity to the construction footprint.

We trust this meets your requirements. Should you require further details or clarification, please do not hesitate to contact the undersigned or Natalie Black, Senior Environmental Manager (0431 249 360).

Yours faithfully,



Warwick Muir

Ecologist / Arborist

BSc AQF5

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9.0 References

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Appendix A – Tree Schedule

Appendix A– Assessed Tree Schedule

Tree ID	*Scientific Name*	Common Name	DBH (m)	DAB (m)	Canopy Spread (m)				Canopy Spread Average	Estimated Total Canopy Area	Height (m)	Age Class	Health	Structure	Landscape significance rating	Estimated life expectancy	Retention Value	TPZ (m)	SRZ (m)	Remove/Retain	TPZ Encroachment
					N	E	S	W	(m)	(m^2)											
1	*Melaleuca quinquenervia*	Broad-leaved Paperbark	1.27	1.38	8	7	6	8	7.25	165	14	Mature	Good	Fair	High	15-40	High	15.0	3.8	Remove (SRZ Encroachment)	
2	*Melaleuca quinquenervia*	Broad-leaved Paperbark	0.54	0.66	7	5	5	7	6	113	14	Mature	Good	Good	High	15-40	Moderate	6.5	2.8	Retain (Protection)	
3	*Eucalyptus robusta*	Swamp Mahogany	0.82	0.92	6	4	2	6	4.5	64	10	Over-mature	Poor	Poor	High	.5-15	Moderate	9.8	3.2	Retain (Protection	20%
4	*Melaleuca quinquenervia*	Broad-leaved Paperbark	0.62	0.72	5	5	4	6	5	79	13	Mature	Good	Good	High	15-40	Moderate	7.4	2.9	Retain (Protection	
5	*Melaleuca quinquenervia*	Broad-leaved Paperbark	0.44	0.54	4	3	3	4	3.5	38	13	Mature	Good	Good	High	15-40	Moderate	5.3	2.6	Retain (Protection	
6	*Eucalyptus robusta*	Swamp Mahogany	0.65	0.75	4	5	5	5	4.75	71	15	Over-mature	Poor	Fair	High	.5-15	Moderate	7.8	2.9	Retain (Protection	

Appendix B – Glossary

GLOSSARY

Age Classes

- Juvenile refers to an immature tree.
- Semi-mature refers to a tree between immaturity and full size.
- Mature refers to a full-sized tree with some capacity for further growth.
- Over-mature refers to a tree already in decline.

Diameter at breast height (DBH)

Tree stem diameter at 1.4 metres above ground level.

Diameter at buttress (DAB)

Tree stem diameter as measured above the root buttress at ground level.

Tree Protection Zone (TPZ)

An indicative measure of the area necessary to protect for tree viability, encompassing the area necessary to protect both the crown and woody roots as calculated by the formula TPZ= DBH x 12

Structural Root Zone (SRZ)

An indicative measure of the spread of the primary woody and structural roots necessary for tree stability, as calculated by the formula SRZ= $(DAB*50)^{0.42}x0.64$

Visual Tree Assessment (VTA)

Visual inspection of tree only.

Co-dominant leaders

A tree where two or more stems are of similar diameter.

Included Bark Junctions

A junction where the angle of the union creates an area of ingrown bark. This can create a structural weakness, and is often found on co-dominant stems.

Crown

The portion of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Stem

The position of the tree consisting of branches and leaves and any part of the trunk from which branches arise. An organ which supports branches, leaves, flowers and fruits.

Epicormic Growth

Refers to shoots produced by dormant buds within the bark or stem of a tree as a result of stress, incorrect pruning or increased light.

Health Condition

Exceptional

- Visually complete crown with dense foliage throughout that indicates strong health and vigour.
- Leaf size and colour that is true to type for the species and free from pest (insect) and disease (pathogen) damage.
- Expected levels of primary growth or seasonal extension and internodal growth evident for the species.

- No evidence of colonising saprophytes and no deadwood evident.

Good

- Visually complete crown, varying in foliage density throughout.
- Leaf size and colour that is true to type for the species with none or minor levels of pest (insect) and/or disease (pathogen) damage evident.
- Expected levels of primary growth or seasonal extension and internodal growth evident for the species.
- No evidence of colonising saprophytes and low levels of deadwood present and approximately 10mm or less in size.

Fair

- Sparse crown, varying in foliage density throughout.
- Reduced leaf size and atypical in colour for the species.
- Low to medium levels of pest (insect) and/or disease (pathogen) damage.
- Reduced, seasonal extension and internodal growth.
- Deadwood easily visible and less than approximately 30mm in size.
- Epicormic growth may be evident.

Poor

- Obvious signs of crown decline, exhibiting significant reduction in live crown volume and foliage density with reduced leaf size and atypical in colour for the species.
- Evidence of defoliation and/or dieback of branch tips.
- Medium to high levels of pest (insect) and disease (pathogen) damage.
- Presence of exudates (kino and resins) from wounds (open and/or weeping).
- Significant reduction in seasonal extension and internodal growth, with significant levels of epicormic growth evident.
- Deadwood easily visible, approximately 30mm to 100mm in size.

Dead

- No evidence of live foliage observed throughout the crown.
- Obvious signs of cracking and shrinking wood.
- Visible evidence of delaminating bark to stems and branches.

Structure Condition

Very Good

- Strong branch unions at attachment points with no acute angles (compression and tension forks) and good branch taper at unions.
- No visibly, defective tree parts or structural defects.
- No wounds to stems and branches, no crossing and rubbing of branches and no wounds to exposed roots.
- No fungal fruiting bodies present to stems, branches and roots indicating, a presence of fungal pathogens.

Good to Fair

- Developing inclusions at unions of leading, codominant stems and branches.

- Evidence of defective tree parts (low levels) including branch and stem inclusions and crossing and rubbing of branches.
- Evidence of mechanical damage to periderm of stems, branches and roots, exposing vascular tissues.
- Exposed wounds for surface, colonising pathogens and entry points for developing decay.
- Presence of fungal fruiting bodies.
- Some evidence of cavities or hollows. (Fair only)
- No evidence of soil upheaval surrounding base of tree.

Poor

- Obvious signs and evidence of included bark to basal unions of codominant, leading stems and branches.
- Advanced, structural defects evident with failure of tree parts determined within 5 years from time of inspection and assessment.
- Evidence of decay from open wounds with presence of exudates (kino and resins) and exposed and degraded woody tissues.
- Presence of fungal fruiting bodies.
- Presence of cavities and hollows.
- Evidence of mechanical damage with advanced degradation of exposed roots.

a) Hazardous Tree

b) Immediate Removal

- Advanced, structural defects evident. Open cracks to codominant stem and branch unions evident.
- Previous branch and stem failures evident. Failure of remaining tree parts determined within 3 months 6 months, from time of inspection and assessment. Arboricultural works to be scheduled immediately to mitigate associated hazard and risk.
- Severed roots and soil upheaval evident indicating failure of root zone.
- Tree failure imminent within 12 months from time of inspection and assessment

Landscape Significance

Assesses a tree within the landscape and rates according to criteria taken from Morton (2006):

1. Significant

- The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance; or
- The subject tree forms part of the curtilage of a Heritage Item (building / structure /artifact as defined under the LEP) and has a known or documented association with that item; or
- The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to commemorate an important historical event; or
- The subject tree is scheduled as a Threatened Species or is a key indicator species of an Endangered Ecological Community as defined under the or Biodiversity Conservation Act 2016 (NSW) or The Environmental Protection and Biodiversity Conservation Act 1999 (Federal); or

- The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species; or
- The subject tree is a Remnant Tree, being a tree in existence prior to development of the area; or
- The subject tree has a very large live crown size exceeding 300m² with normal to dense foliage cover, is located in a visually prominent in the landscape, exhibits very good form and habit typical of the species and makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity; or
- The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.

2. Very high

- The tree has a strong historical association with a heritage item (building/structure/artifact/garden etc) within or adjacent the property and/or
- Exemplifies a particular era or style of landscape design associated with the original development of the site; or
- The subject tree is listed on Council's Significant Tree Register; or
- The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link/ Wildlife Corridor or has known wildlife habitat value;
- The subject tree has a very large live crown size exceeding 200m²; a crown density exceeding 70% Crown Cover (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area.

3. High

- The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence; or
- The tree is a locally-indigenous species and representative of the original vegetation of the area; or
- The subject tree has a large live crown size exceeding 100m²; and
- The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (eg crown distortion/suppression) with a crown density of at least 70% Crown Cover (normal); and
- The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area.

4. Moderate

- The subject tree has a medium live crown size exceeding 40m²; and
- The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% Crown Cover (thinning to normal); and
- The tree makes a fair contribution to the visual character and amenity of the area; and
- The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms.
- The tree has no known or suspected historical association

5. Low

- The subject tree has a small live crown size of less than 40m² and can be replaced within the short term with new tree planting; or
- The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% Crown Cover (sparse); and
- The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area.

6. Very low

- The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or a nuisance species.
- The subject tree is scheduled as exempt (not protected) under the provisions of the local Council's Tree Preservation Order due to its species, nuisance or position relative to buildings or other structures.

7. Insignificant

- The tree is a declared Noxious Weed under the Biosecurity Act (NSW) 2015or identified as a priority weed within the local region.

Appendix C – Site Photographs

Plate 1 Above: Tree 3. Note the central decay column which extends from the crown to base.

Plate 2 Below: Tree 3. Note the failed branches and canopy head.

Plate 3 Above: Trees 4 (Left), 5 (Centre) and 6 (Right).

Plate 4 Below: Trees 1 (Left) to 6 (Right) from the development footprint.

Plate 5 Above: Tree 1 Canopy.

Plate 6 Below: Tree 2.

Plate 7 Above: Tree 1 Canopy branches within the subject site.

Plate 8 Below: Tree 6 canopy, with established strangler fig visible.

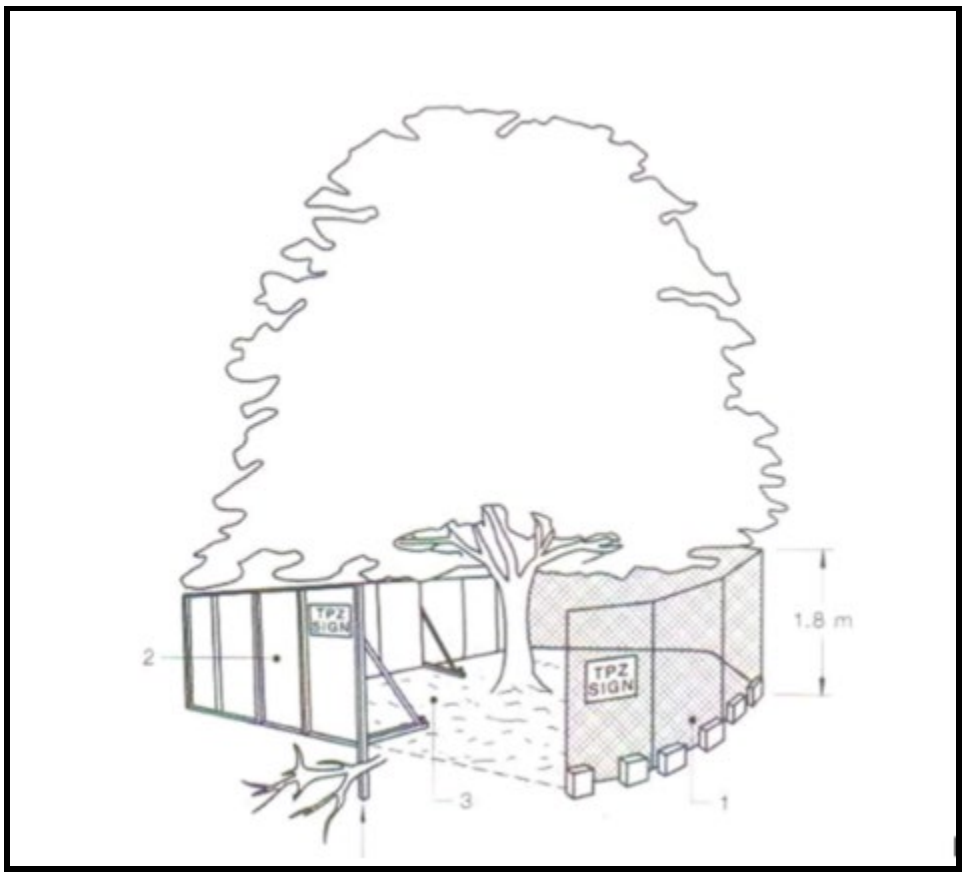
Appendix D –Tree Protection Fencing and Ground Protection

Example of tree protection fencing:

1. Fence off all trees noted for retention with 1.8m steel mesh fencing at the perimeter of the designated protection zone. Attach signs relating to the importance of tree protection and penalties for breaching tree protection orders to the fencing. If the area is large, install multiple signs.

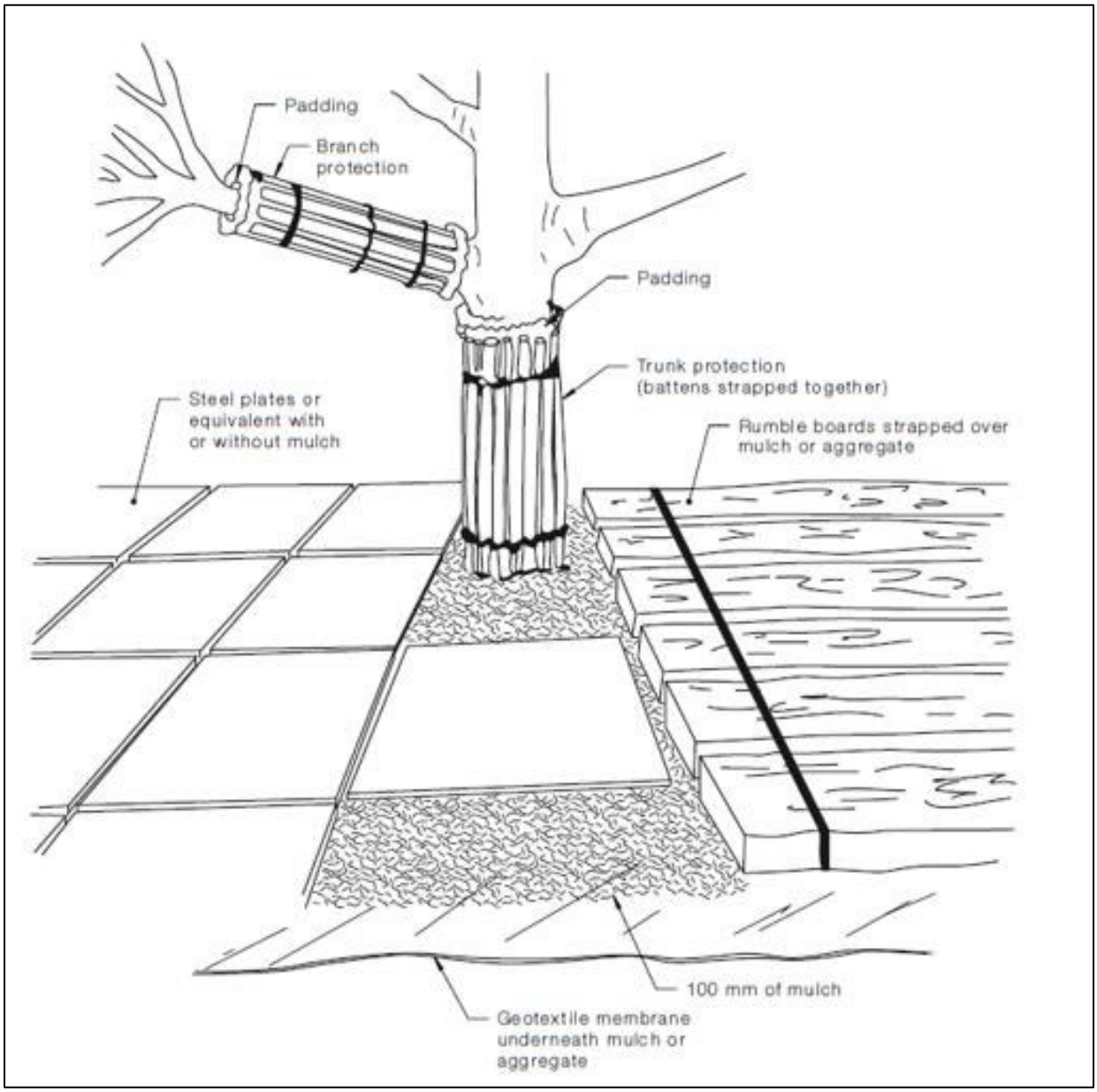
2. Signs should state that this is a restricted area, no entry unless in the company of the arborist. Authorised access to the protected zone could be through a locked gate or via ladders

3. Mulching and semi-regular watering for established protection zones.



Ground Protection

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile beneath a layer a mulch or crushed rock below rumble boards as per the below diagram.



Notes:

1. For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to the trees, not nailed or screwed.
2. Rumble boards should be of suitable thickness to prevent compaction and root damage.

Our Ref: 23050 Ecological Appraisal – Concept Sewer Alignment 30-10-2023
Via: email

Date: 30 October 2023

Attn: Jamie Graham
Monteath & Powys
Tonella Commercial Centre
125 Bull Street
Newcastle West, NSW 2302

Dear Jamie

RE: ECOLOGICAL APPRAISAL – CONCEPT SEWER ALIGNMENT, 42 FULLERTON COVE ROAD

MJD Environmental is writing to you in reference to an ecological appraisal of a concept sewer main alignment that will be associated with the development at 42 Fullerton Cove Road, Fullerton Cove NSW.

Concept Proposal

The concept sewer main is to be co-located with a sewer main to be constructed by the adjacent development situated on the northern side of Fullerton Cove Road, which has been previously assessed and approved as a part of that DA. This ecological appraisal reflects a site assessment conducted by MJD Environmental to determine the likelihood of the proposal having impacts outside the scope of the approved sewer main alignment.

The concept sewer main alignment follows the south road verge of Fullerton Cove Road, approximately 200 m northeast of the roundabout at The Cove Drive and will then underbore beneath Fullerton Cove Rd approximately 20 m southeast of the roundabout. The sewer then follows an existing managed unsealed access track for approximately 300 m, before underboring beneath a patch of native vegetation for approximately 200 m, with the final trench emerging in a cleared area before connecting to a wastewater pumping station (WWPS) located within The Cove Village. Refer to **Attachment 1**.

Site Inspection

A site inspection examining vegetation within a 10 m study area of the concept sewer main was conducted by an ecologist on the 27th of September 2023. At the time of the assessment, the works associated with adjacent development were underway, with the path of the co-located sewer main having been survey and marked. Excavation works had yet to be undertaken, and therefore, the vegetation along the proposed sewer main was intact. As such, along the northern section of the proposal, prior to the first underbore, the vegetation was predominately characterised by cleared or managed road verges and easements, consisting of mown exotic turf or fringing exotic vegetation. The access track south of the roundabout is similarly characterised, with significant gravelled areas that had little to no vegetation. Along this access track is overhanging native canopy and sub-canopy species, such as *Casuarina, Eucalyptus* and *Acacia*, however, this canopy vegetation is not expected to be impacted by the proposal. The proposed sewer main intersects a patch of disturbed Swamp Sclerophyll Forest commensurate with a Threatened Ecological Community (TEC), with the second underbore being utilised to avoid impacts to this vegetation.

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PO Box 360 Waratah NSW 2298
MJDenvironmental.com.au

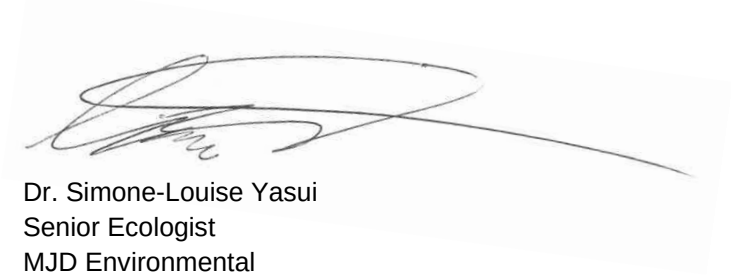
The final section of the proposal emerges in a cleared area that is characterised by a dense ground layer of exotic grasses. At the southernmost point of the proposal, where the sewer connects to the WWPS, is an area of native vegetation. This vegetation is predominately characterised by dense stand of *Leptospermum* regrowth, which falls within the current 10 m study area and may, subject to future detailed engineering design be impacted by the proposal. Refer to **Attachment 2**.

Summary

Generally, the study area associated with the concept sewer main is characterised by disturbed habitat containing exotic vegetation. In areas of extant native vegetation, underbores will be utilised to avoid impact to or removal of native vegetation, with a particular focus on Swamp Sclerophyll Forest TEC. Future detailed engineering design to be completed for pipeline installation must carefully consider the location of launch and receive pits to minimise disturbance in and around areas of native vegetation observed during our inspection. It is reasonable to conclude from our initial appraisal and consideration of ecological constraints observed that impacts to native vegetation can largely be avoided save the southernmost area of alignment where some *Leptospermum* regrowth may be disturbed.

We trust this is sufficient for your purposes, however, should you require any further information or clarification, please do not hesitate to contact Matt Doherty or the writer.

Yours sincerely



Dr. Simone-Louise Yasui
Senior Ecologist
MJD Environmental

Encl: Attachment 1: Concept Sewer Main Alignment Proposal (Northrop NL161067 - CSK01.pdf)
Attachment 2: Ecological Inspection Observations

LEGEND

W	EXISTING WATER MAIN
S	EXISTING SEWER GRAVITY MAIN
RM	EXISTING 250mm SEWER RISING MAIN
RM	PROPOSED INGENIA SEWER RISING MAIN
RM	PROPOSED SEWER RISING MAIN

NOTES

ALL SERVICE LOCATIONS AND BOUNDARIES INDICATIVE ONLY

DRAWN: J.STAUB
DESIGNED: A.TURNBULL
JOB MANAGER: L.MCRAE
VERIFIER:

DIAL BEFORE YOU DIG www.1100.com.au

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
A	PRELIMINARY ISSUE	AT		LM	17.08.23
B	PRELIMINARY ISSUE	AT		LM	30.08.23

CLIENT

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
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SCALE 1:2000@ A1 (0 20 40 60 80 100m)

NORTHROP
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Ph (02) 4943 1777 Email newcastle@northrop.com.au
ABN 81 094 433 100

PROJECT

42 FULLERTON COVE ROAD, FULLERTON COVE, NSW 2318

DRAWING TITLE

PROPOSED PRIVATE SEWER RISING MAIN ALIGNMENT

JOB NUMBER **NL161067**

DRAWING NUMBER **CSK01.01**

REVISION **B**

DRAWING SHEET SIZE = A1

Date : 30.08.2023 5:19 PM Plotted By : AIDAN TURNBULL Found : Y:\YEAR 2016 Jobs\NL161067\0 - Drawings\CIVIL\SKETCH\CSK01 - SERVICING SKETCH\NL161067 - CSK01.dwg

42 FULLERTON COVE ROAD

ATTACHMENT 2: ECOLOGICAL INSPECTION OBSERVATIONS

Legend

- Study Area (10m Buffer)
- Concept Sewer Alignment
- Cadastral Boundaries

Vegetation

- Swamp Sclerophyll Forest (TEC)
- Leptospermum Regrowth
- Exotic Vegetation
- Not Vegetated

0 25 50 100

Meters

1:2,000

N W E S

MJD Environmental

Aerial: NearMap (2023) | Data: MJD Environmental, Spatial Services (2023) | Datum/Projection: GDA 2020 MGA Zone 56 | Date: 30/10/2023 | Version 1 | Z:\23050 - 42 Fullerton Cove Road\23050_42FullertonCoveRd_20230925.mxd | This plan should not be relied upon for critical design dimensions.