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Biodiversity & Riparian Assessment Report

Planning Proposal

Lot 437 DP 755242
1377 Hue Hue Road Wyee, NSW

Prepared for: **Topa Property Pty Ltd**

10 October 2022

AEP Ref: **2389**

Revision: **04**

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AEP Project Team	Tim Mouton Natalie Black Andrew Harker Bonni Yare Chris Wark

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EXECUTIVE SUMMARY

Anderson Environment & Planning was commissioned by Topa Property Pty Ltd (the client) to undertake a Biodiversity & Riparian Assessment Report (BRAR) for a Planning Proposal to rezone RU2 – Rural Landscape and a small part of C2- Environmental Conservation lands (0.11ha) to R2 – Low Density at 1377 Hue Hue Road, Wyee (the Subject Site).

The Subject Site contains two residential dwellings, and a number of rural sheds and structures associated with keeping horses.

Native vegetation within the Study Area consists of Dry Sclerophyll Forest, Moist Forest, and Swamp Forest. Swamp Forest present on site is commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains EEC*. Vegetation within the Subject Site (development footprint) predominantly consists of exotic grassland with a handful of paddock trees. A small patch of remnant forest is present within the south-eastern boundary of the Subject Site, which is connected to vegetation surrounding Mannering Creek. The majority of remnant vegetation is located outside of the proposed rezoning site.

The conclusions of the EAR indicate that the site could provide a small amount of marginal habitat for a small number of threatened flora and fauna species. However, none were recorded on site during recent fieldwork or via other sources such as the NSW Bionet Atlas.

Assessment under the Biodiversity and Conservation State Environmental Planning Policy (BC SEPP) 2021 – Chapter 4 Koala Habitat Protection 2021 (SEPP 2021) revealed that the Subject Site contains preferred Koala Feed Trees as listed within Schedule 2 of BC SEPP 2021. Ground-truthing by Spot Assessment Technique (SAT) and nocturnal surveys revealed no Koala presence within the site. As such the site does not constitute “Core Koala Habitat” as defined within the policy, and no further provision of BC SEPP 2021 applies to the site.

Consideration of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) revealed that impacts on Matters of National Environmental Significance are considered unlikely to occur.

General recommendations are included at the end of this report for consideration to minimise localised impacts on biodiversity in general as a result of the rezoning and future development of the site including the regeneration of the C2 lands in the south of the Study Area.

Contents

Tables

Figures

Appendices

1.0 Introduction

Anderson Environment & Planning was commissioned by Topa Property Pty Ltd (the client) to undertake a Biodiversity & Riparian Assessment Report (BRAR) for a Planning Proposal to rezone RU2 – Rural landscape and a small portion of C2 – Environmental Conservation lands to R2 – Low Density at 1377 Hue Hue Road, Wyee (the Subject Site).

At the request of Topa Property Pty Ltd (the client), Anderson Environment & Planning (AEP) have undertaken necessary investigations for the production of a Biodiversity Assessment, which will inform the rezoning proposal (pre-gateway determination). This assessment has been undertaken with reference to the NSW Environmental Planning and Assessment Act 1979 (EP&A Act), the NSW Biodiversity Conservation Act 2016 (BC Act) and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

This report is specifically intended to indicate the likelihood of the proposal having a significant impact on threatened species or ecological communities. In this regard, the report aims to recognise the relevant requirements of the EP&A Act, the (BC Act and the EPBC Act. Consideration of other relevant policies is given including Biodiversity and Conservation State Environmental Planning Policy (BC SEPP) 2021 – Chapter 4 Koala Habitat Protection 2021 (SEPP 2021). The purpose of this report is to:

- Describe the ecological values of the Subject Site;
- Explore the potential for threatened species to utilise the area; and
- Assess ecological impacts associated with the proposal against relevant legislation.

Potential ecological impacts on native species in general are also considered, as are recommendations for minimising any impacts within the scope of the rezoning.

For the purposes of referencing, this document should be referred to as:

> Anderson Environment & Planning (2022). *Biodiversity Assessment Report for Planning Proposal Rev 02 at 1377 Hue Hue Road Wyee, NSW*. Unpublished report for Topa Property Pty Ltd. September 2022.

2.0 Site Particulars

- **Address** – 1377 Hue Hue Road Wyee, NSW.
- **LGA** – Lake Macquarie Council.
- **Title Details** – Lot 437 DP 755242.
- **Study Area** – The Study Area encompasses the entirety of Lot 437 DP 755242 and part of the Digary Road easement adjacent to the western boundary of the lot. The Study Area covers approximately 5.14ha.
- **Subject Site** – The Subject Site encompasses the proposed subdivision footprint within Lot 437 DP 755242, including part of the Digary Road easement along the western boundary of the lot. The Subject Site covers approximately 4.25ha.
- **Zoning** – Under the *Lake Macquarie Local Environmental Plan 2014* (the LEP), the Study Area is zoned RU2 – Rural Landscape and C2 – Environmental Conservation.
- **Current Land Use** – Lot 437 DP 755242 is occupied by two residential dwellings at the front of the lot. The surrounding areas in the northern and central portion of the lot contain pasture, including stock fencing and a number of rural sheds and structures associated with keeping horses. The southern portion of the lot contains a patch of remnant native forest, associated with vegetation surrounding Mannering Creek, which flows through the far southern corner of the lot.

  Part of the remnant vegetation within the southern portion of the Study Area (approx. 0.334ha) is commensurate with Swamp Sclerophyll Forest on Coastal Floodplains Endangered Ecological Community (EEC), the Study Area also contains vegetation that is commensurate with River-flat Eucalypt Forest on Coastal Floodplains (EEC), 0.05ha within the Subject Site and 0.55ha within the southern portion of the Parent Lot, outside the development footprint.
- **Surrounding Land Use** – The site is bounded by Hue Hue Rd to the north, beyond which lies low density residential and semi-rural properties containing scattered patches of remnant bushland. Cleared agricultural land and the F3 Motorway lies to the west, and a residential sub-division lies to the east. Remnant vegetation occurs to the south, which is associated with riparian areas surrounding Mannering Creek.
- **Proposed Development** – Planning Proposal to rezone RU2 – Rural landscape and residual C2 – Environmental Conservation lands to R2 – Low Density at 1377 Hue Hue Road, Wyee (the Subject Site).
- **Limitation** - The Subject Site has been deemed appropriate for proposed rezoning given there is limited to no Biodiversity Value within the proposed residential area. The proposal will also include the regeneration of the riparian area along Mannering Creek, assisting with improved water quality, habitat and foraging for listed species such as Squirrel Glider.

  The do-nothing option, will retain marginal habitat, however it is likely that the riparian area along Mannering Creek will continue to be grazed, limiting regeneration of important feed tree for Squirrel Gliders due to horse trampling and grazing on new shoots. The impact from hard hooved animals also impacts on erosion of the creek banks and bed along with reduce water quality downstream.

  Therefore, the Planning Proposal is considered likely to improve the water quality, regeneration of plant communities providing both habitat and foraging opportunities within the Study Area.

Figure 1 depicts the extent of the site overlain on an aerial photograph of the locality.

AEP

Figure 1 - Site Location

Date: July 2022

Location: 1377 Hue Hue Rd, Wyee, NSW

Client: Topa Property Pty Ltd

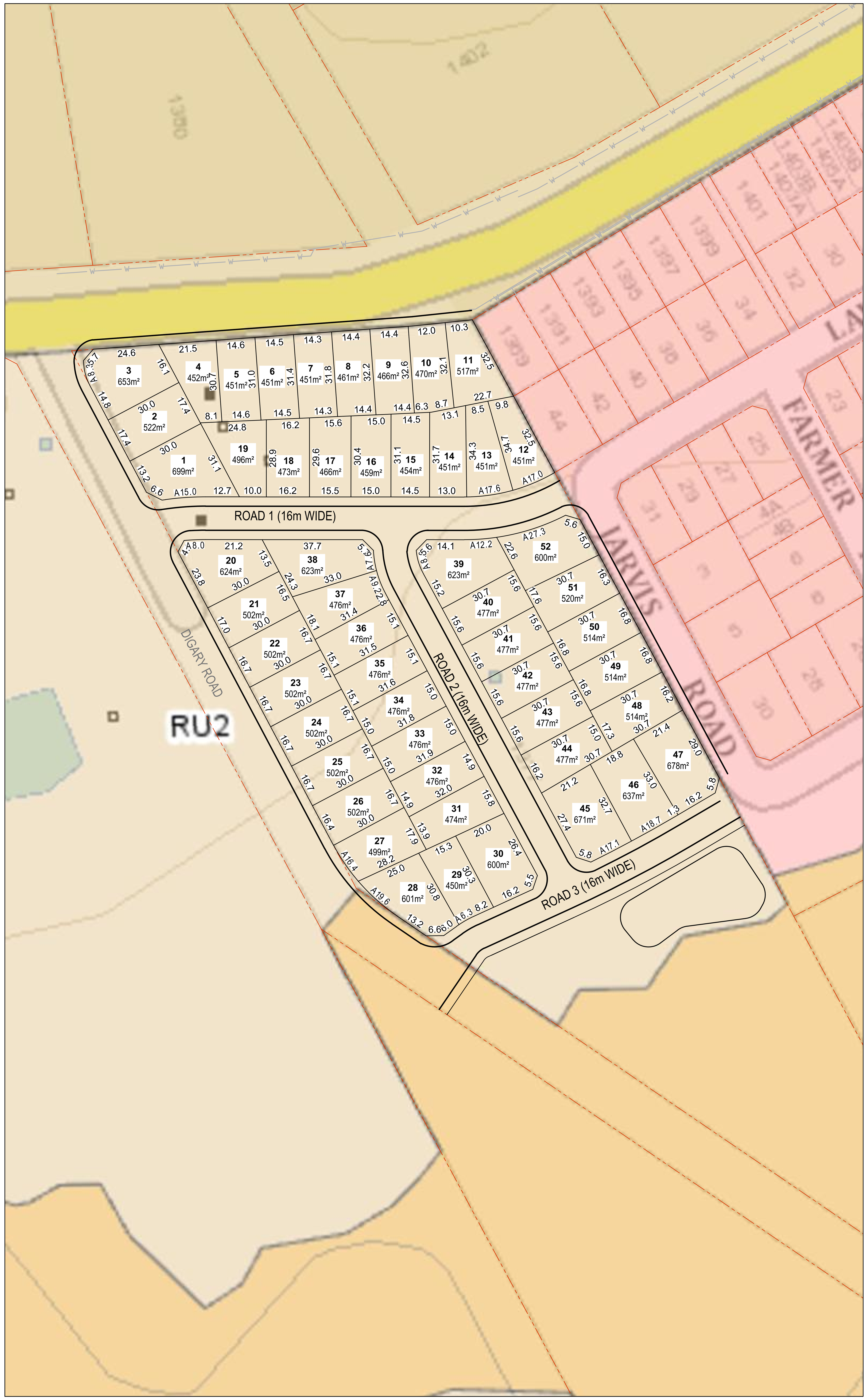
AEP ref: 2389.01

3.0 Proposed Development

It is proposed to rezone the part of the site that is zoned RU2 to R2 Low Density Residential. The existing extent of C2 zoned lands within the lot is to remain.

Figure 2 depicts the proposed development plan within the Subject Site and surrounding lot (Study Area).

NORTH



LEGEND

EXISTING CADASTRAL	
PROPOSED LOT	

ISSUED FOR INFORMATION

Rev	Drawn	Design	Appd.	Date	Revision Description
02	OS	PB	JP	27/04/2021	ISSUE FOR INFORMATION
01	PB	PB	-	21/04/2021	ISSUE FOR INFORMATION

Scale:
0 10 20 30 40 50 60 70 80 90 100
SCALE 1:1000 (A1) SCALE 1:2000 (A3)

For: NEWQUEST PROJECTS

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Project: HUE HUE ROAD WYEE

Title: CONCEPT PLAN OF SUBDIVISION

Project No.	Set No.	Milestone	Plan	Revision
21-0089	02	SK	001	02

4.0 Scope and Purpose

Investigations were carried out in the Subject Site and via literature / database searches to gather information required to adequately address Section 7.3 of the BC Act (known as the “5-part test”).

Also afforded consideration were the Commonwealth EPBC Act, and relevant State Environmental Planning Policies (SEPPs).

The assessment approach was tailored to undertake sufficient works to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific development. This was achieved by background research and literature review, database searches, consultation, targeted ecological fieldwork and mapping, detailed habitat assessment, and ultimately impact assessment consideration against the type and form of development proposed.

Impact assessment was undertaken with due reference to the “*Threatened Species Assessment Guidelines*” (DECC 2007).

Specifically, the scope of this study is to:

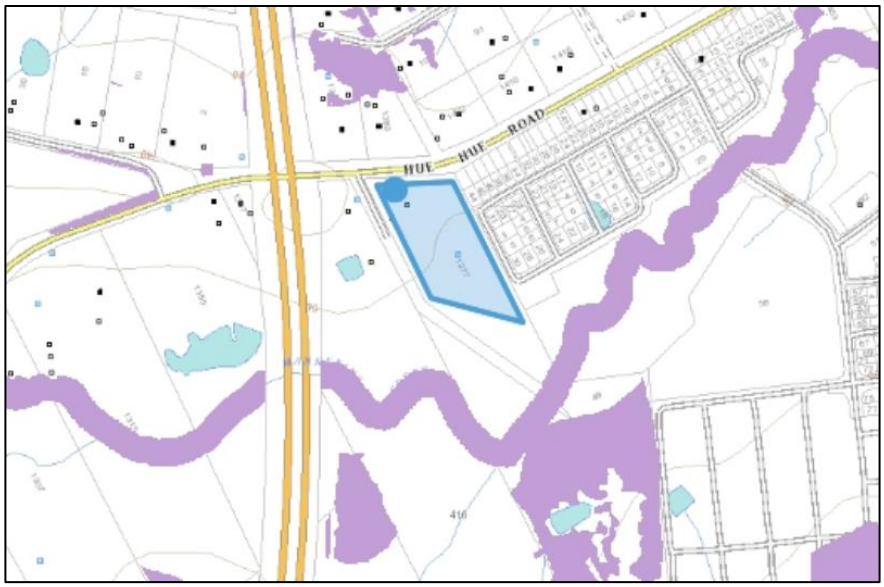
- Identify vascular plant species occurring within the site, including any threatened species listed under the BC Act or EPBC Act;
- Identify and map the extent of vegetation communities within the site, including any EECs listed under the BC Act or EPBC Act;
- Identify any fauna species, including threatened and migratory species, and populations or their habitats, which occur within the site and are known to occur in the wider locality;
- Assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the site; and
- Describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

In addition to the survey work conducted within the site boundary and its immediate surrounds, consideration has been afforded to the wider locality, via database searches within 10km of the site and via consideration of habitat areas that may be linked ecologically to the site.

Biodiversity Values Map

The Biodiversity Values Map (BV Map) identifies land with high biodiversity value, as defined by the Biodiversity Conservation Regulation 2017. The Biodiversity Offsets Scheme (BOS) applies to all local developments, major projects or the clearing of native vegetation where the SEPP (Vegetation in Non-Rural Areas) 2017 applies. Any of these will require entry into the BOS if they occur on land mapped on the BV Map. Exempt and complying development or private native forestry are not subject to the Biodiversity Offsets Scheme.

The BV Map does not intersect with the Subject Site; however, a small area is mapped within the C2 zone in the southern corner of the Study Area (encompassing lot). As no clearing of native vegetation is to be undertaken within a mapped BV area, this proposal does not trigger the BC Act and the requirement for a Biodiversity Development Assessment Report (BDAR) under these criteria.



Area Clearing Threshold

"The area threshold varies depending on the minimum lot size (shown in the Lot Size Maps made under the relevant Local Environmental Plan (LEP)), or actual lot size (where there is no minimum lot size provided for the relevant land under the LEP). The area threshold applies to all proposed native vegetation clearing associated with a development proposal".

Table 1 – Area Clearing Thresholds (BC Act)

Minimum lot size	Threshold for clearing, above which the BAM and offsets scheme apply
< 1ha	**>0.25ha**
1ha to <40ha	>0.5ha.
40ha to <1000ha	>1.0ha
>1000ha	>2ha

In this case, the minimum lot size will be 450m^2 following rezoning, therefore the area clearing threshold is >0.25ha. As the area of vegetation to be removed totals approx. 0.23ha, which is under the 0.25ha threshold, the BOS is not triggered, and as such the preparation of a BDAR is not required based on the clearing thresholds.

5.0 Study Certification and Licencing

The fieldwork and reporting for this assessment was undertaken by Tim Mouton BEnvSc MEnvSc (BAAS: no. 19083), Bonni Yare (BSc), Sarah Currie (BSc), Warwick Muir (BEnvScMgt) of Anderson Environment & Planning and the review of the report was undertaken by Natalie Black BSc (Hons), MPL & Cert IV TAE & MSc (BAAS no. 19076).

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 Care and Ethics Committee Certificate of Approval (Trim File No: 14/600(2)) issued by NSW Agriculture.

Certification:

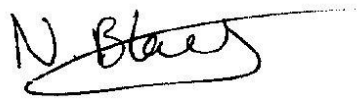
As the principal author, I, Natalie Black, make the following certification:

The results presented in the report are, in the opinion of the principal author and certifier, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area;

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 Author and Certifier:



Natalie Black
Senior Environmental Manager
Anderson Environment & Planning
BAAS 19076

6.0 Methodology

The field surveys for the site have been prepared and performed with due recognition of the Lake Macquarie Council Flora and Fauna Survey Guidelines (2012).

The size of the site, the type of native vegetation and habitats remaining, the status of existing and proposed surrounding land use, and the level and type of habitat linkages to proximate bushland areas were considered in formulating the methodology employed and described below.

The assessment approach was tailored to undertake sufficient works to ensure that legislative requirements were met relating to threatened species and native species in general for the proposed specific development.

6.1 Information Sources

Information and spatial data provided within this EAR has been compiled from various sources including:

- Aerial Photograph Interpretation (API) of the site and surrounding locality;
- *NSW Biodiversity Values Map* (accessed 2022);
- Regional vegetation mapping prepared by Dr Stephen Bell (Eastcoast Flora Survey) for Lake Macquarie Council (Bell 2016)
- State survey guidelines (DEC 2004; DECC 2009; OEH 2016, DPIE 2020);
- OEH Threatened Species, Populations and Ecological Communities website (*https://www.environment.nsw.gov.au/AtlasApp/UI_Modules/TSM_/Default.aspx?a=1*) (accessed 2021); and
- Collective knowledge gained from previous ecological survey and assessment in the area over the past 25 years.

In addition, database searches were carried out, namely:

- Review of flora and fauna records held by the NSW Office of Environment & Heritage (OEH) Atlas of NSW Wildlife within a 10km radius of the site (July 2021); and
- Review of flora and fauna records held by the Commonwealth Department of Energy and Environment (DoEE) Protected Matters Search within a 5km radius of the Subject Site (July 2021).

6.2 Field Survey

6.2.1 Vegetation Communities

Vegetation was surveyed utilising a variety of methods, as outlined below.

- Regional mapping for the site by Bell (2016) was considered (refer **Figure 3**);
- Aerial Photo interpretation (API) to identify any notable variations within the site;
- Consultation of 1:25,000 topographic map series for the area;
- Inspection of the site to ground truth the unit(s) identified; and
- Identification of the vegetation map unit occurred via identification of required dominant species in community structural layers.

The final derived vegetation map was based on dominant species present in the over-storey, shrub and ground layers, with adjustments made to boundaries as required. The dominant species composition,

structural and physical attributes were all considered when assigning the best fit ecological communities.

Consideration was given to the potential for the derived vegetation communities to constitute EECs as listed under the BC Act and/or EPBC Act. The floristic composition, geomorphological characteristics and geographical extent were important considerations in this process. The type and location of the relevant vegetation communities can be seen in **Figure 3.**

6.2.2 Flora

A flora survey was undertaken to produce a flora species list for the Subject Site and surrounding C2 lands, to search specifically for threatened flora species known from the wider locality, and to gather data necessary to both derive vegetation community type(s) and to meet relevant survey guidelines. Such works included:

- Plot based survey in areas of differing vegetation composition and condition. six (6) plots (20x50m) were surveyed utilising techniques outlined in the BAM 2020 guideline, recording species composition within the 20x20m subset and functional attributes within the full 20x50m;
- Identification of all other vascular plant species encountered during fieldwork; and
- Systematic Study Area coverage to ensure all key points of the Study Area were checked, and the Random Meander Technique (Cropper, 1993) was also utilised to maximise species encountered.

6.2.3 Habitat

An assessment of the relative habitat values present within the Subject Site and C2 lands to the south adjacent to Mannering Creek were carried out. This assessment focused primarily on the identification of specific habitat types and resources within the Subject Site favoured by known threatened species from the region. 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. Vertebrate and invertebrate species use hollows as diurnal or nocturnal shelter sites, for rearing young, feeding, thermoregulation, and to facilitate ranging behaviour and dispersal.

Tree hollows were recorded and mapped within the Subject Site and residual lands to the south utilising the methodology of tree hollow identification set by OEH in the BioBanking field plot methodology (Feb 2009), namely:

> *"A hollow is only recorded if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); and (d) the hollow is at least 1 m above the ground (this omits hollows in cut stumps or at the base of trees)".*

6.2.4 Fauna

Fauna survey has been carried out utilising techniques as outlined below**.** Fauna survey work was undertaken with reference to relevant guidelines and to add additional information to the generated Expected Fauna Species List (**Appendix B**).

Avifauna Surveys

The presence of avifauna within the site was carried out via targeted diurnal survey and incidental observations during all other phases of fieldwork.

For diurnal surveys, birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers etc.

Amphibians and Reptiles Surveys

Amphibians and reptile surveys were undertaken during nocturnal surveys in July 2021 and May 2022 (4x hour spotlighting searches). Transects and general surveys (inspecting rocks, logs, litter and human waste such as tyres was undertaken for amphibians and reptiles recorded during diurnal and dusk surveys over a period of four days in July 2021 and May 2022.

Nocturnal Surveys

Nocturnal surveys were undertaken over 4 nights using spotlights and a call-playback device, targeting arboreal mammals, forest owls, and amphibians in areas of identified habitat (hollows, water bodies etc.) No targeted frog surveys were undertaken following periods of high rainfall, this was considered unnecessary given the degraded nature of the farm dam (refer to **Plate 3** for photo).

Mammals

The occurrence of mammals within the site was assessed by utilising habitat assessment as an analogue for presence in combination with diurnal survey. Such habitat includes foraging resources (blossom, herbaceous, prey etc), hollows and roosting opportunity, connectivity and water as outlined in **Section 6.2.3** above.

Remote Monitoring

A Songmeter (SM4 by Wildlife Acoustics) was deployed within the southern part of the study area (retained C2 lands) within remnant vegetation. The device was programmed to record continuously between 5pm and 8am daily. Two (2) baited wildlife cameras were installed within the study area, positioned to capture arboreal fauna. One was installed within the proposed development / rezoning area, and the other within retained C2 lands.

Incidental Observations & Secondary Indications

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

6.2.5 Riparian Assessment

An assessment of the riparian zone associated with Mannering Creek in the far southern corner of the site was undertaken. This survey focussed on the presence of in-stream habitat features (overhanging vegetation, snags), and condition including any factors leading to degradation within and surrounding the creek.

Fauna survey has been carried out utilising techniques as outlined below**.** Fauna survey work was undertaken with reference to relevant guidelines and to add additional information to the generated Expected Fauna Species List (**Appendix B**).

6.2.6 Details of Field Surveys

A summary of the survey effort is below in **Table 2** and **Figure 4**.

6.2.6.1 Survey Dates, Times & Activity

Table 2 – Field Survey Periods

Date	Time	Field Activity	No. of Persons on Site
20/07/21	11:00 – 4:30 5:30 - 6:30	Flora survey, bird survey, habitat assessment, deploy song meter, and incidentals. nocturnal survey,	2
21/07/21	11:00 – 4:30 5:30 - 6:30	BAM plots, bird survey, habitat assessment, deploy fauna cameras, SAT survey, and incidentals. nocturnal survey,	2
10/08/2021	11:00 – 11:50	Collection of equipment and incidentals.	1
22/09/2021	9:00 – 12:00	*Tetratheca juncea, / other flowering orchids*	1
25/05/2022	11:40- 18:00	BAM plots, bird survey, nocturnal survey	1
26/05/2022	16:00 – 18:00	Koala SAT and nocturnal survey	1

The above survey methodology is considered to provide sufficient understanding of the biodiversity of the site and wider Study Area.

In addition, by applying rigorous habitat assessment to more mobile species identified in Bionet Atlas records within the locality, it was ensured that all possible use of the site and wider Study Area by notable species was considered, and accommodated within subsequent biodiversity assessment and management recommendations.

Tables 3 and **4** below outline the works undertaken against the specific requirements of the Lake Macquarie Council Flora and Fauna Guidelines (2012).

Table 3 – Recommended minimum survey effort for flora surveys

Structure	Minimum Survey Effort	Effort Undertaken
Simple Floristic Structure	Combination of walking transects and plot-based surveys 1-2 walking transects, 1 replicate quadrat per community	Random meander throughout the site (2 people), over 2 days (September 2021). 1 BAM plot undertaken per vegetation zone, 3 additional BAM plots were undertaken within the exotic grassland and residual C2 lands within the proposed development in May 2022 (refer to **Figure 4**). A flora list was compiled within each vegetation zone. encompassing the entire Study Area. A full botanical survey was undertaken within the Study Site, and all trees have been identified to species level. Targeted flora transects were undertaken for *Tetratheca juncea* and *Thelymitra adorata* at 5m (1 person) across the Study Area (confirmed flowering time for *Tetratheca juncea* – September, 2021).

Table 4 – Recommended minimum survey effort for fauna groups

Fauna Group	Survey Technique	Survey Period	Minimum Survey Effort	Effort Undertaken and Comments
Birds				
Diurnal Birds	Diurnal Survey	Summer, autumn & winter	1 ha sample plot per site for 20 mins	A bird survey was undertaken in the morning and afternoon over 2 days in July (winter), additional bird surveys were undertaken in May (autumn) over two afternoons.
Nocturnal Birds	Stagwatch potential roost / nest trees	Breeding season	Observing potential roost hollows for 30 mins – prior to sunset and 60 mins following sunset 3-4 nights	Spotlight stagwatching was undertaken at identified HBTs over two consecutive nights before and after sunset in July 2021 and May 2022.
	Pellet / roost / nest tree searches		Searches for potential roost / nest trees	Prior to survey a habitat assessment was undertaken to identify any suitable HBTs. 4 Trees were identified. Five additional HBTs were identified in the adjacent C2 lands. Only 2 HBTs occur within the proposed development footprint (refer to **Figure 4**).
	Formal census		One point census per m2	Spotlighting transects undertaken over 4 nights totalling 4 person hours. 4 call playback sessions were also undertaken over 2 nights, 1 per vegetation zone, 2 additional call playback sessions were undertaken in C2 lands adjacent to the Subject Site over two consecutive nights. A song meter was also installed over a period of 2 weeks in July/August 2021.

Fauna Group	Survey Technique	Survey Period	Minimum Survey Effort	Effort Undertaken and Comments
Mammals				
All Mammals	Spotlighting	All year	2 x 30 min searches on 2 separate nights at walking rate of 1 km/hr per site	Spotlighting transects undertaken throughout the site over 2 consecutive nights in July 2021 which were repeated in May 2022 within C2 lands.
	Stagwatch potential roost / forage trees		Observing potential roost hollows / foraging areas for 30 mins - prior potential to sunset and hollows 60 mins / following sunset	Spotlight stagwatching was undertaken at identified HBTs over two consecutive nights before and after sunset within the Subject lands and again in C2 lands.
	Remote Cameras		100 trap nights over 4 consecutive nights per vegetation community	2 camera traps were installed over a period of 14 days, 1 within riparian forest and 1 within scattered paddock trees.
	Koala quadrats		Follow relevant guidelines in Appendix 6 of the Port Stephens Comprehensive Koala Plan of Management 2001and Australian Koala Foundation (AKF) guidelines.	3 SATs were undertaken covering all vegetation communities on site and within surrounding C2 lands.

6.2.6.2 Survey Limitations

While this survey only constitutes a snapshot of biodiversity at the time it is surveyed it is considered that survey within the Study Area and Subject Site is appropriate for the site condition and size and meets the requirements of LMCC survey guidelines that have been designed with standard ecological survey limitations in mind. Therefore, no further limitations are thought to apply to these surveys that would impact on the results and conclusions contained within this report.

7.0 Results

7.1 Literature Review

Previous datasets consulted prior to fieldwork included those conducted by AEP (2018) at the residential subdivision site directly to the east of the Subject Site, and regional vegetation mapping undertaken by Bell (2016) and NPWS (2003).

7.2 Vegetation Communities

Fieldwork was conducted to ground-truth regional vegetation maps. Fieldwork revealed remnant vegetation within the Study Area to be commensurate with the following vegetation communities as per Bell 2016:

- MU 5h - Alluvial Riparian Blackbutt Forest (EEC)
- MU 43e - Wyong Paperbark Swamp Forest (EEC)
- MU 31 - Coastal Plains Scribbly Gum Woodland

Alluvial Riparian Blackbutt Forest is commensurate with *River-flat Eucalypt Forest on Coastal Floodplains EEC.* Wyong Paperbark Swamp Forest is commensurate with *Swamp Sclerophyll Forest on Coastal Floodplains EEC.*

Areas surrounding mapped native vegetation contain exotic grazed pasture.

Figure 3 shows the extent of vegetation communities present on site as described above in relation to the Study Area and Subject Site. Reference pictures of vegetation communities within the Study Area are included in **Appendix C.**

Table 5 – Vegetation Communities – Total Areas

Vegetation Community	Study Area (ha)	Subject Site (Development Footprint) (ha)
Coastal Plains Scribbly Gum Woodland	0.18	0.18
Alluvial Riparian Blackbutt Forest (EEC)	0.55	0.05
Wyong Paperbark Swamp Forest (EEC)	0.33	0
Infrastructure / Cleared exotic pasture	4.07	4.02
Total Area	**5.14**	**3.8**

7.2.1 Alluvial Riparian Blackbutt Forest (EEC)

This area of vegetation is directly connected to Mannering Creek, which runs through the far southern corner of the Study Area. It is characterised by an overstorey of tall sclerophyllous trees including *Eucalyptus pilularis, Syncarpia glomulifera, Eucalyptus globoidea, Angophora costata,* and *Corymbia maculata.* The midstorey contains mainly mesophyllic shrubs such as *Acmena smithii, Glochidion ferdinandi, Callistemon salignus, Pittosporum revolutum,* and *Acronychia oblongifolia.* This vegetation is generally in moderate to high condition, subject to some edge effects and minor weed invasion including Lantana, Camphor Laurel, and Wandering Jew. Vegetation plots 2 and 5 were undertaken within this community.

Plate 1: Alluvial Riparian Blackbutt Forest (EEC)

7.2.2 Wyong Paperbark Swamp Forest (EEC)

This vegetation community occurs as a discrete pocket contained within the broader Alluvial Riparian Blackbutt Forest in the southern portion of the Study Area, most likely a result of a section of localised impeded drainage. The upper and midstorey is dominated by paperbarks (*Melaleuca nodosa, Melaleuca linarifolia, Melaleuca sieberi, Callistemon salignus*) *Eucalyptus resinifera* and *Eucalyptus robusta.* Other canopy trees present include *Angophora costata* and *Eucalyptus globoidea.* The ground layer contains a mix of grasses and sedges such as *Themeda triandra, Imperata cylindrica, Entolasia stricta, Lomandra longifolia,* and *Gahnia clarkei.* Swamp Mahogany – Paperbark Forest was previously the only native vegetation community present within the Study Area but has undergone approved clearing and now is only present in a regenerating state with scattered *Eucalyptus robusta* (Swamp Mahogany) seedlings. This vegetation is generally in moderate to high condition, subject to some edge effects and minor weed invasion including Lantana and Camphor Laurel. Vegetation plot 3 was undertaken within this community.

Plate 2: Wyong Paperbark Swamp Forest (EEC)

7.2.3 Coastal Plains Scribbly Gum Woodland

This vegetation community occurs as isolated paddock trees and within residual C2 lands to the south-east within grazed exotic pasture, as elevation rises within the central and northern portion of the Study Area and Subject Site. Scattered trees include *Eucalyptus globoidea, Eucalyptus haemastoma, Eucalyptus umbra, Corymbia gummifera, Corymbia maculata,* and *Angophora costata.* Vegetation plot 6 was undertaken within this area.

Plate 3: Coastal Plains Scribbly Gum Woodland and farm dam

7.2.4 Exotic grassland and farm dam

Most of the Subject Site contains heavily grazed exotic pasture with marginal to no native species present with the exception of scattered paddock trees mentioned above. Plots 1 and 4 were undertaken within this vegetation zone. Due to heavy grazing, the site is highly unlikely to be suitable for cryptic species such as terrestrial orchids. The farm dam does not contain any aquatic vegetation and is unlikely to be important habitat for frog species.

7.3 Flora

Flora surveys have resulted in the identification of around 123 species within the Study Area. Approximately 32% of these species are exotics, principally invasive weed species associated with edge effects. No threatened flora species were identified within the development area and surrounding lands during targeted field surveys.

A full list of flora species identified by surveys conducted within the site is included in **Appendix A**.

7.4 Habitat Assessment

The site offers suitable habitat for a range of species within remnant vegetation in the southern C2 zoned portion of the site. This area contains emergent and regrowth canopy trees over a well-structured and diverse shrub layer. Emergent trees contain numerous medium to large hollows. A total of 5 hollow bearing trees (HBTs) were identified within the lot containing approximately 22 hollows, an additional 5 hollow-bearing trees were identified within the surrounding C2 lands containing a total of 7 hollows (refer to **Table 6**)**.** This area is also connected to larger patches of contiguous vegetation to the south associated with Mannering Creek.

Grazed areas containing scattered paddock trees within the central and northern portion of the Subject Site (RU2 zone) only offer limited habitat for highly mobile species. Two (2) HBTs are present in this area, containing a total to 2 small hollows, refer to **Figure 4** for the locations of HBTs.

Habitat assessment of the farm dam has been undertaken, July 2021 and May 2022, the habitat within the farm dam was deem not suitable for aquatic fauna and amphibians, due to the lack of aquatic flora and structures such as logs / rocks. The horses use the farm dam as their main water source trampling flora on the edges which would otherwise provide habitat. Nocturnal surveys of the dam were undertaken both in July 2021 and May 2022, the rainfall seven (7) days prior to the surveys in May 2022 was 41mm hence had Wallum Froglet been located within the dam, its call would have been recorded. Surveys also extended to Mannering Creek.

Table 6 – HBT results

GPS ID	Tree Tag ID	Scientific /common name	dbh (cm)	Hollows size cm					General comments about tree and hollows
				XS	S	M	L	XL	
				<5	5-10	10-15	15-20	>20	
HBT1	-	*Eucalyptus globoidea*	50		1				1 sml fissure in upper limb
HBT2	-	*Eucalyptus pilularis*	-			2	2		Spout hollows
HBT3	-	*Eucalyptus pilularis*	-		8	1			small fissures plus hollows
HBT4	-	*Angophora costata*					3		
HBT5	-	*Angophora costata*						1	Brushtail possum roosting in hollow
HBT6	-	*Corymbia maculata*			2		2		
HBT7	-	*Eucalyptus globoidea*			1				
HBT8	-	*Allocasuarina littoralis*	20	1					Splits in trunk may be suitable for microbats
HBT9	HBT2	*Eucalyptus globoidea*	100	2		1			Rainbow lorikeet nesting in medium hollow, smaller stag hollows
HBT10	-	*Angophora costata*	35		1				In base of trunk
HBT11		*Angophora costata*	120					1	In base of trunk 2m up, too low to be suitable for forest owls
Stag		Stag	65				1		1 Large chimney hollow

7.5 Riparian Assessment

A small section of Mannering Creek runs through the Study Area, approximately 22m in length, in the far southern corner of the site within the existing C2 zone. The following details the existing values and conditions found within the riparian corridor. An additional survey was carried out to investigate the surrounding C2 lands, Mannering Creek meanders throughout this area and a ground-truthed hydroline is included in **Figure 4**.

Vegetation

Riparian vegetation surrounding the creek line is representative of River Flat Eucalypt Forest on Coastal Floodplains EEC. This community is listed as Endangered in NSW and Critically Endangered federally. This vegetation has been mapped as Alluvial Riparian Blackbutt Forest, and contains a canopy of tall sclerophyllous trees over a diverse assemblage of shrubs, scramblers and ground covers dominated by riparian and rainforest species. Vegetation width from the creek to cleared areas to the north is approximately 150m, which represents a high quality and relatively undisturbed vegetated buffer.

Plate 4 – Indicative vegetation

Habitat Value

The creek banks contain a thick covering of vegetation, including tussocks and ferns overhanging the water line, and helping to bind sandy substrates within the bank. Minor undercutting in the bank is evident in some places, creating shelter areas alongside overhanging vegetation. Some small snags and exposed roots are present in the water line. The creek line contains a series of alternating pools and riffles, adding to the diversity of instream habitat.

Plate 5 & 6 - Dense overhanging vegetation and in-stream snags

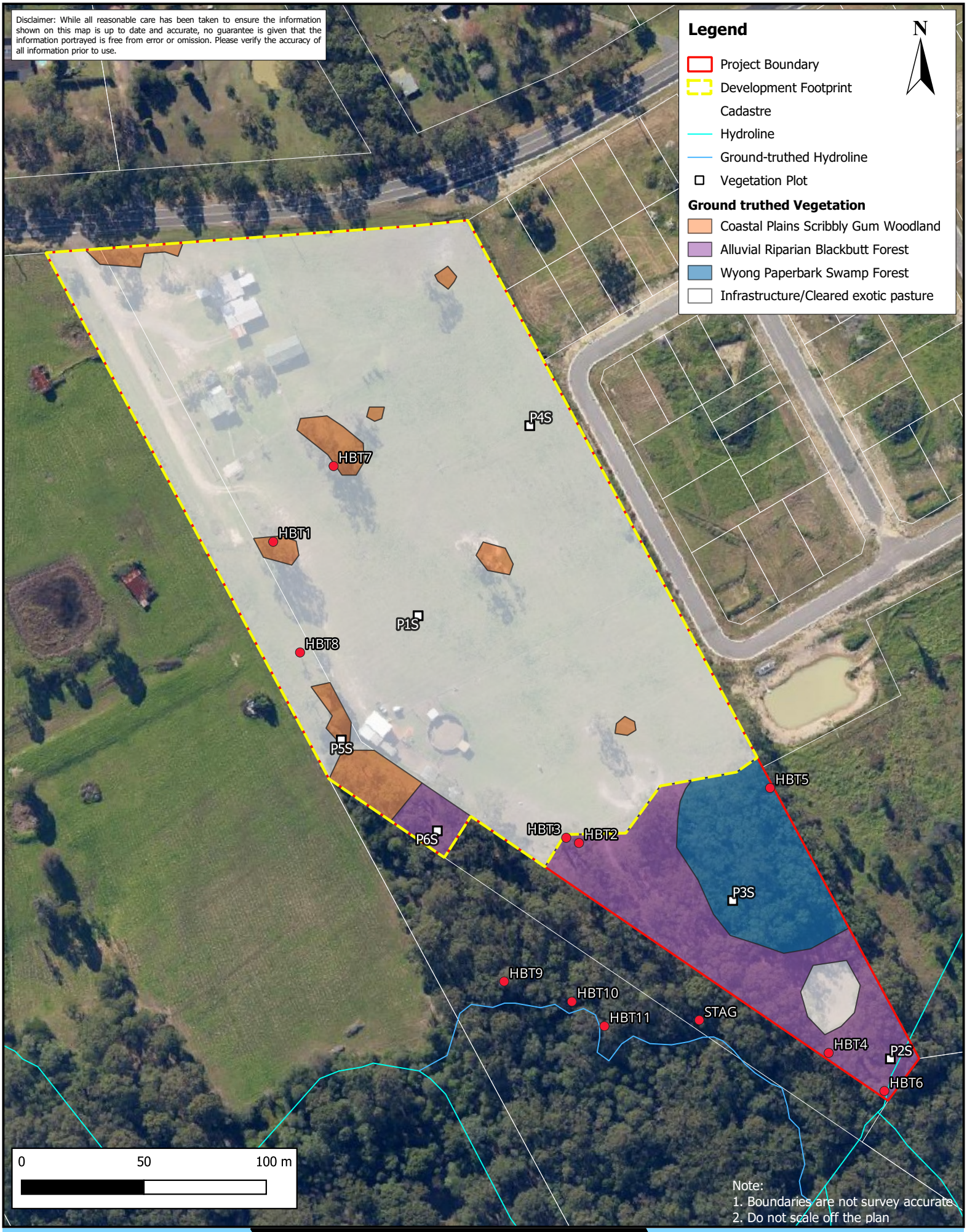
Hydrology

Mannering Creek flows through the site in a north-easterly direction, and was observed to be flowing consistently outside of any recent rainfall events at the time of survey. This creek is classified as a 3rd order stream under the Strahler system. The channel width (top of bank) ranges from 2-4m, in recent surveys the creekline was observed to be over 5m wide and was unable to be crossed. The bank contour is incised and steep, in excess of 45% in most areas. However dense tussocks and roots from overhanging vegetation are creating sufficient stability to bind the bank and minimise any significant erosion. This small segment of the creek on site contains a number of alternating pools and riffles.

Condition

Minor edge effects are evident on the vegetation surrounding the creek line, in the form of weed invasion and soil disturbance from existing tracks and movement of horses. However, the internal condition of the vegetation within 40m of the creek line is high, with minimal weed invasion and disturbance noted. Minor weed invasion was observed along the creek bank, specifically patches of *Tradescantia fluminensis*, however the native resilience is high due to the significant cover and diversity of native ground covers. No rubbish or significant erosion was observed, and the water column looked free of sediment and contaminants. One small informal creek crossing was observed, in the form of crushed bricks placed in the creek bed, however this was not affecting the function or stability of the creek. In recent surveys the creek crossing was not observed and the river was wider than previously observed.

Plate 7 – Material placed in creek (bricks)



AEP

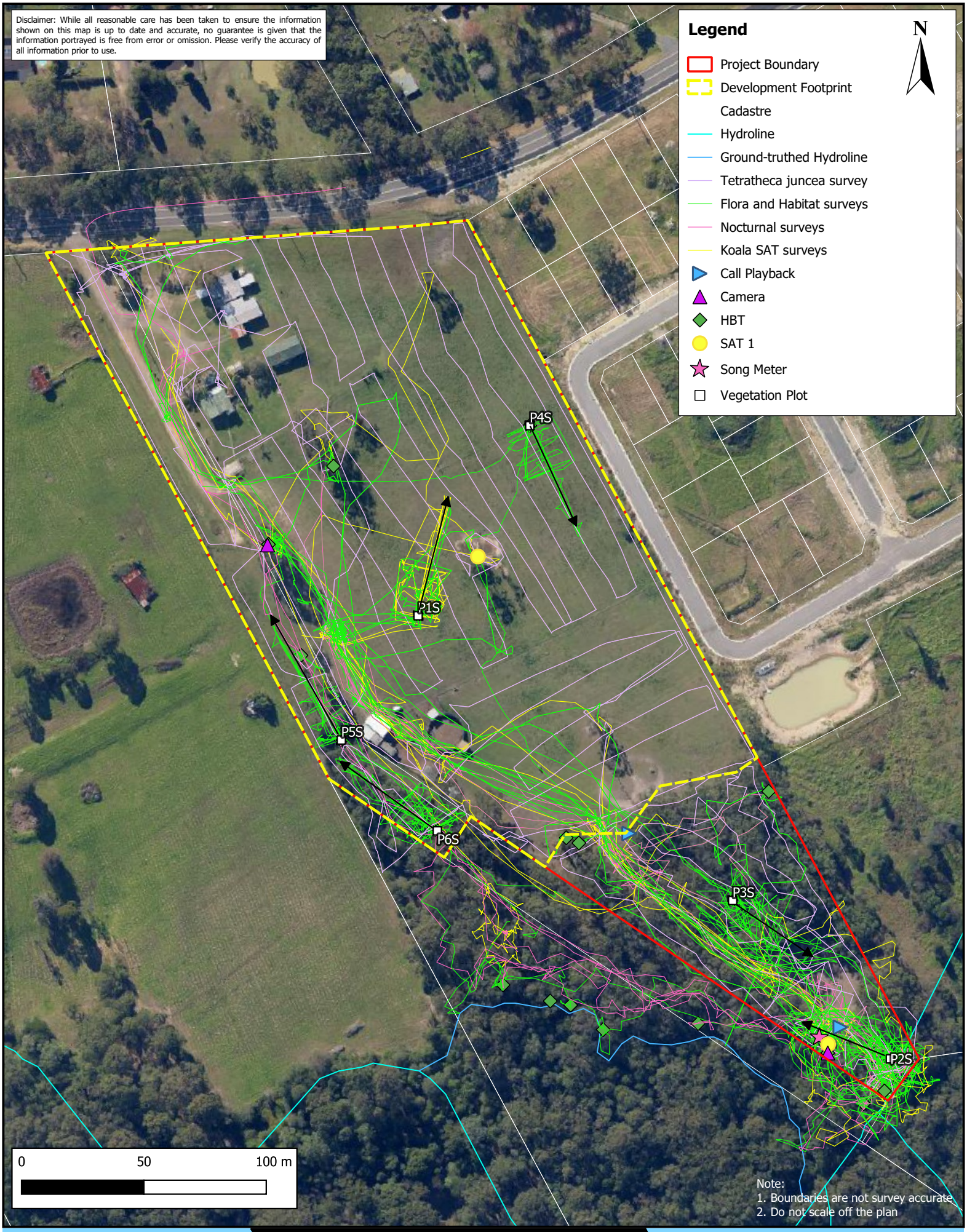
Figure 3 - Ground-truthed Vegetation

Date: Sept 2022

Location: 1377 Hue Hue Rd, Wyee, NSW

Client: Topa Property Pty Ltd

AEP ref: 2389.01



AEP

Figure 4 - Survey Effort

Date: July 2022

Location: 1377 Hue Hue Rd, Wyee, NSW

Client: Topa Property Pty Ltd

AEP ref: 2389.01

7.6 Fauna

Fauna surveys to date have identified 48 species within the Study Area, including 38 birds, 3 amphibians, 2 reptiles, and 5 mammals.

Song Meter results recorded a high diversity of passerines during the diurnal period. The nocturnal recordings were generally unremarkable. One (1) threatened species (Grey-headed Flying-fox) was detected from Song Meter recordings in low abundance, generally indicating a lack of seasonal foraging resource within the study area at the time of the survey.

Within the proposed rezoning / development area, camera trap results were limited, only recording one Antechinus, a Kookaburra and Grey Butcher Bird. Within the retained C2 lands camera trap results recorded regular activity from Sugar Gliders. Other species recorded at this camera include Brushtail Possum and Antechinus.

It was determined that Camera Trap 1 recorded a Sugar Glider due to the white tipped tail and size, as Squirrel Gliders known within the local area the species do not have white tipped tails (refer **Appendix D** for photo.

The results from fauna surveys within the rezoning / development area are indicative of the limited habitat present, predominantly cleared land with scattered paddock trees. Therefore, this area represents only limited foraging habitat for more mobile threatened species. Such species are considered further in following Sections.

A list of fauna species present onsite has been generated for the site and is included within the Expected Fauna List in **Appendix B**.

7.7 Database Searches

Searches were undertaken of databases within a 10km radius of the Subject Site for BC Act listings and 5km radius for EPBC Act listings. Note that any records considered erroneous, historic only, or obviously of no relevance to the site in regards to habitat (e.g. seabirds, marine species etc.) were omitted.

The potential for listed threatened species to occur within the site is considered in **Table 7** and selection for subject species in **Table 8** below. Detailed ecological profiles of threatened species can be found at:

https://www.environment.nsw.gov.au/threatenedspeciesapp/

All species within **Table 7** were targeted during the field surveys in 2021 and 2022, habitat surveys were conducted focusing on all species listed below, if habitat was recorded and the species may be present, they are deemed “Subject Species” and target surveys were undertaken, such as:

- Flora transects;
- Fauna searches;
- Camera trapping;
- Songmeter;
- Diurnal searches;
- SAT’s; and
- Nocturnal.

Table 7 – Threatened Species Appraisal

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
Amphibians				
Crinia tinnula (50)	Wallum Froglet	V		Inhabits heath, woodland and open dry sclerophyll forest and generally restricted to sandstone geology. There are a number of records from the locality within 2km of the site. Given the proximity of the Subject Site to swamp forest and riparian habitat associated with Mannering Creek, there is potential for this species to utilise the site. **SUBJECT SPECIES**
Litoria aurea (1)	Green and Golden Bell Frog	E	V	Only one outdated record (1976) occurs within 10km of the Study Area. One very small dam is present within the Subject Site, which is highly disturbed and contains minimal fringing vegetation as a result of active grazing and stock movements. This would only be considered very marginal habitat. However, given the lack of recent records, and availability of high-quality habitat elsewhere in the locality, this species is unlikely to utilise the site.
Litoria brevipalmata (5)	Green-thighed Frog	V		Records are present approx. 4km south-west of the Study Area. Given the proximity of the Subject Site to swamp forest and riparian habitat associated with Mannering Creek, there is potential for this species to utilise the site. **SUBJECT SPECIES**
Mixophyes iteratus (2)	Giant Barred Frog	E	E	Only two outdated records (1984) occur within 10km of the Study Area. One very small dam is present within the Subject Site, which is highly disturbed and contains minimal fringing vegetation as a result of active grazing and stock movements. This would only be considered very marginal habitat. Given the lack of recent records, and availability of high-quality habitat elsewhere in the locality, this species is unlikely to utilise the site
Birds				
Anthochaera phrygia (7)	Regent Honeyeater	E	CE	Potential foraging habitat is present within the Study Area given the presence of Swamp Mahogany, Spotted Gum and Stringybarks. However, it was not observed or heard on site, and only three Atlas records exist within 4km of the site. In addition, the site is not mapped as important habitat for this species. Therefore, it is considered unlikely to utilise the site to any notable degree.

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
Artamus cyanopterus cyanopterus (3)	Dusky Woodswallow	V		Species not recorded within the Subject Site or Study Area. This species is only an occasional visitor to moist forest and rainforest, and only 3 records exist within 10km of the site. Therefore, it is considered unlikely to utilise the site to any notable degree.
Callocephalon fimbriatum (2)	Gang-gang Cockatoo	V		Species not recorded within Subject Site or Study Area. Prefers open dry forest and woodlands habitat on the coast, which is not present on site. No large hollows are present within the Subject Site. Atlas records indicate presence approx. 4km west of the site within spotted gum-ironbark forest. Given the habitat present on site and low number of records in the locality site utilisation is considered unlikely.
Calyptorhynchus lathami (28)	Glossy Black-Cockatoo	V		Species not recorded within Subject Site or Study Area. Occasional *A. littoralis* present within the Study Area, however none are present within the proposed rezoning area (Subject Site). No foraging usage (crushed cones) was observed. No large hollows are present within the Subject Site. Recent Atlas records indicate presence within 1km of the site. Given no foraging or breeding habitat is available within the Subject Site, it is considered unlikely that the proposed rezoning would affect this species.
Climacteris picumnus victoriae (2)	Brown Treecreeper (eastern subspecies)	V		Species not recorded within the Subject Site or Study Area. This species is only an occasional visitor to moist forest and rainforest, only 3 records exist within 10km of the site. Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Daphoenositta chrysoptera (18)	Varied Sittella	V		No sign of species during fieldwork. Three (3) Atlas records exist within 1km of the Study Area. Very few rough and smooth barked species are present within the Subject Site, which represent marginal habitat. Given the limited habitat available within the Subject Site, this species is considered unlikely to utilise the site.
Ephippiorhynchus asiaticus (6)	Black-necked Stork	E		Generally associated with saltmarsh and wetland habitat on the coast. No suitable habitat present onsite. A total of six (6) The Black -necked Stork records are located 1 – 1.km to the east and 5 – 6km to the north west of the Subject Site. However, these records range from 1991 to 1993. Given the species was not recorded within the Subject Site during both 2021 and 2022 surveys undertaken by AEP and there are no recent records it has been determined that the Subject Site's

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
				severely degraded habitats from past and current land use provides limited to no foraging opportunities. Therefore, the species is unlikely to occur.
Glossopsitta pusilla (24)	Little Lorikeet	V		Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone, however this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Haliaeetus leucogaster (17)	White-bellied Sea-Eagle	V		Numerous records within the locality, however no sign of species or nesting habitat during fieldwork. Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Hirundapus caudacutus (10)	White-throated Needletail		E	Habitat present within the Subject Site would be considered marginal for this species; therefore, it is considered unlikely that the proposed rezoning would affect this species.
Ixobrychus flavicollis (2)	Black Bittern	V		The species inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation, which is not found within the Subject Site. Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Lathamus discolor (9)	Swift Parrot	E	CE	Not Mapped Important Area Mapping. Potential foraging habitat is present within the Study Area given the presence of Swamp Mahogany and Spotted Gum; however, this habitat is absent from the Subject Site. It was not observed or heard on site, and only four Atlas records exist within 10km of the site. In addition, the site is not mapped as important habitat for this species. Therefore, it is considered unlikely to utilise the site to any notable degree.
Lophoictinia isura (2)	Square-tailed Kite	V		Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone; however, this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Ninox strenua (12)	Powerful Owl	V		Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone; however, this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Petroica boodang (3)	Scarlet Robin	V		Species not recorded within the Subject Site or Study Area. This species is only an occasional visitor to moist forest and rainforest, and only 3 records exist within 10km of the site. Therefore, it is considered unlikely to utilise the site to any notable degree.

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
Ptilinopus superbus (1)	Superb Fruit-Dove	V		Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone; however, this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Tyto novaehollandiae (10)	Masked Owl	V		Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone; however, this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Tyto tenebricosa (3)	Sooty Owl	V		Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone; however, this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Mammals				
Cercartetus nanus (3)	Eastern Pygmy-possum	V		Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone; however, this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Chalinolobus dwyeri (6)	Large-eared Pied Bat	V		This species is cave dependent. While the site may provide foraging habitat, it is considered unlikely to occur or be impacted to any notable degree by the proposal.
Dasyurus maculatus (2)	Spotted-tailed Quoll	V	E	Species not detected during survey. Suitable foraging and breeding habitat is present within the riparian zone; however, this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Falsistrellus tasmaniensis (14)	Eastern False Pipistrelle	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning.
Micronomus norfolkensis (48)	Eastern Coastal Free-tailed Bat	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning.
Miniopterus australis (67)	Little Bent-winged Bat	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning. No suitable breeding habitat is present for this cave dependant species.

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
Miniopterus orianae oceanensis (32)	Large Bent-winged Bat	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning. No suitable breeding habitat is present for this cave dependant species.
Myotis Macropus (25)	Southern Myotis	V		A number of records exist from the locality. One very small dam is present within the Subject Site, which is highly disturbed and contains minimal fringing vegetation as a result of active grazing and stock movements. This would only be considered very marginal habitat. However, given the proximity of the Subject Site to swamp forest and riparian habitat associated with Mannering Creek, there is potential for this species to utilise the site. **SUBJECT SPECIES**
Petauroides Volans (2)	Greater Glider		V	Species not detected during survey. Suitable foraging and roosting habitat is present within the riparian zone; however this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Phascolarctos cinereus (2)	Koala	V	V	No evidence of the species during recent surveys, considered unlikely to be impact by the proposed rezoning.
Petaurus australis (10)	Yellow-bellied Glider	V		Species not detected during survey. Suitable foraging and roosting habitat is present within the riparian zone; however this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Petaurus norfolcensis (82)	Squirrel Glider	V		Species not detected during survey. Suitable foraging and roosting habitat is present within the riparian zone. Marginal foraging and roosting habitat is present within the Subject Site (proposed rezoning site). Given the number of nearby records, it is likely that this species may utilise the C2 lands to the south (wider Study Area). **SUBJECT SPECIES**
Phoniscus papuensis (2)	Golden-tipped Bat	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning.
Pseudomys gracilicaudatus (2)	Eastern Chestnut Mouse	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning.

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
Pteropus poliocephalus (31)	Grey-headed Flying-fox	V	V	Species was detected in the vicinity of the Study Area from a Song Meter positioned within retained C2 lands. Given the absence of suitable foraging habitat within the Subject Site, and high-quality adjacent habitat, it is considered unlikely that this species would be affected as a result of a rezoning / development proposal.
Saccolaimus flaviventris (4)	Yellow-bellied Sheathtail-bat	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning.
Scoteanax rueppellii (21)	Greater Broad-nosed Bat	V		The absence of suitable foraging habitat on the Subject Site means the species is unlikely to be impacted by the proposed rezoning.
Reptiles				
Hoplocephalus stephensii (1)	Stephen's Banded Snake	V		Species not detected during survey. Suitable foraging and roosting habitat is present within the riparian zone; however this habitat is absent from the Subject Site (proposed rezoning site). Therefore, it is considered unlikely that the proposed rezoning would affect this species.
Plants				
Acacia bynoeana (49)	Bynoe's Wattle	E	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Angophora inopina (1989)	Charmhaven Apple	V	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Callistemon linearifolius (1)	Netted Bottle Brush	V		Not recorded during survey effort. Only one record known within 10km of the Study Area. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Corunastylis sp. Charmhaven (NSW896673) (102)		CE	CE	The Subject Site at best represents extremely marginal habitat as it is currently under active grazing, and contains little to no native groundcover. Therefore, this species us unlikely to occur on site.
Corybas dowlingii (11)	Red Helmet Orchid	E		The Subject Site at best represents extremely marginal habitat as it is currently under active grazing, and contains little to no native groundcover. Therefore, this species us unlikely to occur on

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
				site. Suitable habitat is present in the Subject Area towards Mannering Creek; however this area will not be impacted on by the proposed development.
Cryptostylis hunteriana (27)	Leafless Tongue Orchid	V	V	The Subject Site at best represents extremely marginal habitat as it is currently under active grazing, and contains little to no native groundcover. Therefore, this species us unlikely to occur on site.
Eucalyptus camfieldii (1)	Camfield's Stringybark	V	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Eucalyptus parramattensis subsp. decadens (1)		V	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Eucalyptus parramattensis subsp. parramattensis (12)	Eucalyptus parramattensis C. Hall. subsp. parramattensis in Wyong and Lake Macquarie local government areas	E		Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Genoplesium insigne (70)	Variable Midge Orchid	CE	CE	The Subject Site at best represents extremely marginal habitat as it is currently under active grazing, and contains little to no native groundcover. Therefore, this species us unlikely to occur on site.
Grevillea parviflora subsp. parviflora (27)	Small-flower Grevillea	V	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Maundia triglochinoides (1)		V		Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Melaleuca biconvexa (271)	Biconvex Paperbark	V	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.

Scientific Name	Common Name	BC Act	EPBC Act	Likelihood of Occurrence
Rhodamnia rubescens (108)	Scrub Turpentine	E		Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Rutidosis heterogama (2)	Heath Wrinklewort	V	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Syzygium paniculatum (1)	Magenta Lilly Pilly	E	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Tetratheca juncea (495)	Black-eyed Susan	V	V	Not recorded during survey effort. Unlikely to go undetected considering thorough flora surveys undertaken of the site.
Thelymitra adorata (50)	Wyong Sun Orchid	CE	CE	The Subject Site at best represents extremely marginal habitat as it is currently under active grazing, and contains little to no native groundcover. Therefore, this species us unlikely to occur on site.

Table Key - Status (BC Act & EPBC Act):
CE: Critically Endangered, E: Endangered, V: Vulnerable
(#) – Indicates number of Atlas Records within 10km of the Subject Site

Appendix G shows the Subject Site is not mapped Important Habitat for Regent Honeyeater, Swift, Migratory Shorebirds or Plains-wanders. Therefore, no further assessment Is required. A total of six (6) The Black -necked Stork records are located 1 – 1.5km to the east and 5 – 6km to the north west of the Subject Site. However, these records range from 1991 to 1993. Given the species was not recorded within the Subject Site during both 2021 and 2022 surveys undertaken by AEP and there are no recent records it has been determined that the Subject Site's severely degraded habitats from past and current land use provides limited to no foraging opportunities. As a result, no further assessment is required.

7.7.1 Subject Species

From the above, the following species are considered key subject or indicator species for the Subject Site due to being recorded on site, potentially likely to forage and roost or nest on the site, the site potentially forms an important part of a local home range for resident specimens and some potential habitat will be removed by the proposal.

Table 8 lists species that were considered to occur on site, this is based on field data and desktop information. Searches were carried out for trees and shrubs such as *Angophora inopina* and *Eucalyptus paramattensis* given the low number of trees and the extensive surveys within the Subject Site (SATs, HBTs) all trees were survey. It is also noted that these species can be identified all year and are easily distinguished. Targeted searches carried out for *Tetratheca juncea* were undertaken in September and orchids such as *Thelymitra adorata* were not detected during field surveys. Further the heavily grazed paddocks are considered unsuitable for orchids due to compaction of the soil from grazing.

Table 8 – Subject Species

Scientific Name	Common Name	BC Act	EPBC Act
Amphibians			
Crinia tinnula (50)	Wallum Froglet	V	
Litoria brevipalmata (5)	Green-thighed Frog	V	
Aves			
Daphoenositta chrysoptera (18)	Varied Sittella	V	
Mammals			
Myotis Macropus (25)	Southern Myotis	V	

Table Key - Status (BC Act & EPBC Act):
CE: Critically Endangered, E: Endangered, V: Vulnerable
(#) – Indicates number of Atlas Records within 10km of the Subject Site

8.0 Key Species Considerations

The species identified for further consideration have been categorised into guilds in **Table 9**. By considering these species and their lifecycle needs, many other species are also inadvertently considered. The analysis below considers key lifecycle features for each guild of species in more detail, and assists in informing the subsequent 5-part test assessment.

Table 9 – Key Species Analysis

Guild / Species	Key Habitat Feature	Comment
Frogs Incl. Wallum Froglet Green-thighed Frog	Habitat / proximity to creekline	Subject Site may provide marginal non-breeding habitat resources for a number of amphibian species. Whilst mostly cleared and degraded due to grazing, the site may form part of a foraging range, given the proximity to more suitable habitats adjacent to the site, namely Mannering Creek.
Birds Incl. Varied Sittella	Habitat / scattered trees and proximity to remnant forest	Subject Site may provide marginal non-breeding habitat resources for a number of insectivorous and nectar feeding birds within scattered paddock trees. Whilst mostly cleared and degraded due to grazing, the site may form part of a foraging range, given the proximity to more suitable habitats

Guild / Species	Key Habitat Feature	Comment
		adjacent to the site, specifically remnant forest surrounding Mannering Creek.
Mammals Incl. Southern Myotis and Squirrel glider	Habitat / proximity to creekline	The vegetation adjacent to the Subject Site contains suitable foraging and breeding habitat for Southern Myotis, including suitable water bodies and adjacent hollows. Given the proximity of this habitat, the Subject Site may provide marginal non-breeding habitat resources. It is likely that Squirrel gliders may utilise the surrounding C2 lands to the south of the proposed development. The proposed development footprint contains scattered trees and a small area of forest adjacent to the proposed retained lands. This area lacks suitable hollows but may offer marginal foraging habitat. Due to the proximity of higher quality vegetation and resources, impacts to this species are considered to be marginal.

9.0 5-Part Test Assessment

Section 7.3 of the BC Act lists five factors that must be taken into account in determining the significance of potential impacts of proposed activities on threatened species, populations, ecological communities and/or their habitats as listed within the BC Act.

The 5-part test is used to determine whether there is likely to be a significant impact, and thus whether the Biodiversity Offsets Scheme (BOS) is triggered or a Species Impact Statement (SIS) is required.

The 5-part test is used to determine whether there is likely to be a significant impact, and thus whether the Biodiversity Offsets Scheme (BOS) is triggered.

a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction

Under this proposal 4.02ha of exotic grassland and 0.23ha of native vegetation (scattered paddock trees and remnant vegetation) will be cleared. It is considered unlikely that the proposed rezoning will have an adverse effect on the life cycle of any species utilising the site where they would be placed at risk of localised extinction.

Frogs:

Threatened frog species were not recorded during recurring surveys after 41mm of rainfall in May 2022 (refer **Appendix D** for weather data). The only potential habitat present within the Subject Site is a small farm dam. This represents limited to no habitat as it is highly degraded due to grazing and stock movements, containing minimal fringing vegetation and limited to no surrounding habitat. High quality habitat is present within and surrounding Mannering Creek within retained lands to the south of the Subject Site. In addition, it is proposed to provide supplementary habitat as part of the development with the installation of a frog pond associated with the subdivision detention basin. Given the relative abundance of higher quality and more suitable habitat within the adjacent lands, and the provision of supplementary habitat as part of proposed stormwater management works, it is considered unlikely any frog species will be significantly impacted upon.

Birds:

No threatened birds were observed or heard during surveys. Marginal foraging habitat is present within the subject site in the form of scattered paddock trees, including stringy barks, which are favoured by the Varied Sittella. However, given the relative abundance of higher quality and more suitable habitat within the adjacent lands, it is considered unlikely this species will be significantly impacted upon.

Mammals:

Southern Myotis

The vegetation adjacent to the Subject Site contains suitable foraging and breeding habitat for Southern Myotis, in the form of a water body (Mannering Creek) and hollow bearing trees. However, habitat is very limited within the Subject Site as it is predominantly clear of native vegetation. A small dam is present within the Subject Site, which may represent a marginal foraging resource, however given the proximity of adjacent suitable habitat, it is considered unlikely this species will be significantly impacted upon.

Squirrel Glider

The vegetation within the Subject Site that occurs within C2 lands that is proposed to be removed is connected to higher quality vegetation within the wider Study Area and may provide suitable foraging habitat for this species, however this area is degraded and represents a small portion of this remnant

(0.05ha), as such impacts to this species are considered to be marginal. Management and enhancement of Squirrel Glider habitat such as planting of food trees, weed removal to promote natural regeneration of feed trees and the installation of nest boxes within the C2 land will significantly enhance both foraging ad nesting opportunities for the species within the Site. Therefore, it is considered unlikely this species will be significantly impacted upon.

b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

River-Flat Eucalypt Forest

Part of the vegetation within the Study Site is commensurate with the BC listed EEC; River-Flat Eucalypt Forest (0.05ha) and is connected with a larger patch of remnant EEC to the south of the lot and within the adjacent lands. This residual vegetation is proposed to be removed as part of the development, resulting in direct impacts to an EEC.

Adverse or long-term impacts to the larger remnant EEC to the south are unlikely to be impacted by the removal of 0.05ha of residual vegetation, further as part of the development proposal, the rest of the lot south of the Subject Site is proposed to be regenerated under a vegetation management plan and will strengthen the quality and resilience of the EEC and increase habitat values of the bushland remnant for resident flora and fauna.

Indirect impacts to EEC

Vegetation directly adjacent to the site to the south, represents Swamp Sclerophyll Forest EEC and River-Flat Eucalypt Forest EEC. While the proposal will not directly impact this vegetation, there is potential for indirect impacts to occur as a result of an adjacent development, such as alterations to hydrological conditions.

As part of the proposed development a Stormwater Management Plan will be prepared to ensure there is no detrimental impacts upon downstream ecology caused by development of the site. Furthermore, the proposed development will be constructed with adequate subsurface drainage, runoff collection systems, and basins, in-conjunction with the local street network to manage the surficial run off volume. Drainage design should also include measures such as Water Sensitive Urban Design (WSUD). It is considered unlikely the proposed development will impact the existing groundwater or surface water regimes.

It is therefore considered that impacts to hydrological conditions and residual clearing caused by the proposed development to surrounding EEC will be negligible and unlikely to place the local occurrence of this community at risk of local extinction.

ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The vegetation to be impacted by the proposed development occurs on the edge of higher quality vegetation and is currently grazed. Removal of this vegetation will create further edge effects to the south, although this is expected to be negligible and adverse modification and risk of extinction is highly unlikely due to a small fraction of vegetation to be removed (0.05ha).

As discussed above, impacts to hydrological regimes posed by the development will be mitigated by level design and stormwater infrastructure resulting in negligible impacts to surrounding ecosystems.

c) in relation to the habitat of a threatened species or ecological community:

i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Vegetation that will be removed by the proposal predominantly consists of exotic pasture (4.02ha), with some scattered paddock trees (0.18ha). With 0.05ha of EEC vegetation is proposed to be removed. 0.84ha of habitat is to be retained and managed as part of an existing C2 Zone (environmental conservation) as part of the proposed rezoning. Due to the small amount of native vegetation to be removed and extremely fragmented nature of this habitat, it does not represent a significant extent in relation to the Study Area or wider locality.

ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

As mentioned above habitat to be removed within the Subject Site is highly fragmented as a result of clearing for agriculture, and the site continues to be managed under this type of land use. Remnant areas of vegetation within the Study Area (existing Lot) are to be retained as part of the existing C2 zone. A small portion of remnant vegetation (0.05ha) is proposed to be removed within the C2 zone in the south-east of the Subject Site, removal of this vegetation will create edge effects into the remaining remnant vegetation but will not fragment or isolate the remaining vegetation within the Study Area, or impact on potential connectivity for fauna.

iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality

The removal of 4.02ha of exotic grassland and 0.23ha of fragmented native vegetation as part of the proposed rezoning and development will not affect the long-term survival of nearby ecological communities.

The habitat is not considered important to the survival of any threatened species within the locality. The small amount of remnant vegetation to be removed may be utilised for foraging for a number of threatened species however removal of this vegetation us highly unlikely to impact on the long-term survival of species or threatened ecological communities.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly)

No area of outstanding biodiversity value is present.

e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process (KTP)

The rezoning / development has potential to contribute to the following KTPs:

- ***Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands***

Mannering Creek is located approximately 180m to the south of the Subject Site, including surrounding vegetation representative of Swamp Sclerophyll Forest EEC and River-Flat Eucalypt Forest EEC. While the proposal will not directly impact vegetation surrounding the creek, there is potential for indirect impacts to occur as a result of an adjacent development, such as alterations to hydrological conditions.

As mentioned above, the proposal is not expected to significantly alter existing flow regimes subject to application of stormwater engineering controls.

- ***Anthropogenic climate change***

The rezoning / development as proposed will contribute in a small way to the processes causing Anthropogenic Climate Change via the removal of vegetation which act as a carbon sink. It is not considered the contribution to this KTP in this instance is of a notable magnitude.

- ***Clearing of native vegetation***

The proposal will remove a small amount of fragmented vegetation (0.23ha) contained within a rural property predominantly containing exotic pasture (4.02ha). It is not considered the contribution to this KTP in this instance is of a notable magnitude.

- ***Invasion and establishment of aggressive weed species and exotic perennial grasses***

The majority of the site contains exotic pasture continually suppressed by grazing. If grazing is removed prior to development there is some potential for high threat exotics (HTEs) to proliferate, and pose a risk during clearing works. Appropriate controls should be put in place to reduce the spread of weeds, particularly high threat exotics (HTEs) during and after works.

- ***Infection of native plants by Phytophthora cinnamomic***

There is potential for proposed construction works to inadvertently introduce *Phytophthora cinnamomi* into the site, which may lead to infection and degradation of retained and adjacent vegetation areas. As such, it is recommended that appropriate controls are put in place for all construction related activity to limit such potential, particularly given the proximity to mapped Coastal Wetlands.

- ***Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae***

There is potential for the proposal to contribute to this KTP during the clearing and construction phase. Appropriate hygiene protocols are outlined within **Section 15**. If such controls are implemented, the risk for the development to contribute to this KTP will be minimised.

- ***Infection of frogs by Amphibian Chytrid causing the disease Chytridiomycosis***

There is potential for development of the site to introduce, or increase the risk of, infection of frogs with amphibian chytrid which may lead to degraded health and loss of individuals within the local area. As such, it is recommended that appropriate controls are put in place for all construction related activity to limit such potential.

10.0 State Environmental Planning Policy (Koala Habitat Protection) 2020

The former State Environment Planning Policy (Koala Habitat Protection 2021) commenced on 17 March 2021, under the Environmental Planning and Assessment Act 1979, and repealing the previous State Environmental Planning Policy (Koala Habitat Protection) 2019 ("BC SEPP 2019"). This policy has now been repealed (1 March 2022) and now falls under the Biodiversity and Conservation SEPP 2021 (BC SEPP). As discussed above no policy changes have been made.

BC SEPP 2021, aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

AEP undertook the following desktop and field assessment to determine if the Site is Core Koala Habitat in accordance with Chapter 3 of SEPP.

3.6 Step 1—Is the land potential koala habitat?

(1) Before a council may grant consent to a development application for consent to carry out development on land to which this Part applies, the council must be satisfied as to whether or not the land is a potential koala habitat.

(2) The council may be satisfied as to whether or not land is a potential koala habitat only on information obtained by it, or by the applicant, from a person who is qualified and experienced in tree identification.

(3) If the council is satisfied—

(a) that the land is not a potential koala habitat, it is not prevented, because of this Chapter, from granting consent to the development application, or

(b) that the land is a potential koala habitat, it must comply with section 3.7.

Approx. 16-17% of the canopy trees within the Study Area consisted of listed koala feed trees and as such further surveys were undertaken to determine if the Subject Site is Core Koala Habitat. AEP undertook Koala surveys during July 2021 and May 2022 including Survey effort for Koalas included:

- Targeted searches including nocturnal searches;
- Spot Assessment Technique (Phillips & Callaghan 2011) – 3 SATs undertaken;
- Call playback;
- Camera trapping; and
- Passive Song Meter recording.

3.7 Step 2—Is the land core koala habitat?

(1) Before a council may grant consent to a development application for consent to carry out development on land to which this Part applies that it is satisfied is a potential koala habitat, it must satisfy itself as to whether or not the land is a core koala habitat.

(2) The council may be satisfied as to whether or not land is a core koala habitat only on information obtained by it, or by the applicant, from a person with appropriate qualifications and experience in biological science and fauna survey and management.

(3) If the council is satisfied—

(a) that the land is not a core koala habitat, it is not prevented, because of this Chapter, from granting consent to the development application, or

(b) that the land is a core koala habitat, it must comply with section 3.8.

The above surveys did not result in the observation or recording of Koala's within the Study Area, therefore it has been determined that the Site is not Core Koala Habitat and no further investigation are required.

11.0 EPBC Act Assessment

A search was conducted in July 2021 of Matters of National Environmental Significance (MNES) as relevant to the *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act). The following MNES are considered in this assessment.

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

National Heritage Places:
The site is not a National Heritage Place and does not contain any matters of national heritage.

Wetlands of International Significance (declared Ramsar wetlands):
The site is not proximate to any wetlands of international significance.

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

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

Threatened Ecological Communities:
The following EPBC TEC's are considered likely to occur within the region.

Coastal Swamp Oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community – does not occur within the Study Area.

Coastal Upland Swamps in the Sydney Basin Bioregion – does not occur within the Study Area. Restricted to Hawkesbury sandstone plateaus generally between 200 & 600m.

Subtropical and Temperate Coastal Saltmarsh – does not occur within the Study Area. The site not within the intertidal zone.

River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria – This community is present in the Study Area within retained lands surrounding Mannering Creek, however and occurs within the Subject Site, however the 0.05ha of disturbed vegetation of this community type that will be directly impacted should not represent a significant impact to this community.

While *Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions* - This community is present in the Study Area within retained lands surrounding Mannering Creek, however it does not occur withing the Subject Site and will not be affected by the proposed development.

Threatened Species:

No threatened species listed within the EPBC Act have been detected on the site, and while the small area of habitat may offer resources for species should they occur, it is unlikely that the removal of approx. 4.02ha of exotic grassland containing 0.23ha of scattered native vegetation will have any meaningful impact of the life cycle of any threatened species.

Migratory Species:

A number of EPBC listed migratory species have some potential to visit the site on an irregular basis. However, it is not considered that the rezoning and development of this land as proposed is likely to significantly affect the availability of potential habitat for such mobile species, or disrupt migratory patterns.

EPBC Act Assessment Conclusion:

Consideration of the EPBC Act revealed that significant impacts on MNES as a result of rezoning and development of the land as proposed are unlikely to occur.

12.0 Recommendations

The following general recommendations are made for consideration to minimise localised impacts on biodiversity in general as a result of the rezoning and development of the site:

- A Stormwater Management Plan should be prepared as part of the proposed development, to ensure there is no detrimental impacts upon downstream ecology. This plan will outline measures such as subsurface drainage, runoff collection systems, detention basins, and Water Sensitive Urban Design (WSUD). Design of a sediment / detention basin should also consider measures to provide additional frog habitat, including pond sections of varying depth and fringing habitat such as plantings and refuge features (rock cobble). This will also help mitigate the loss of the small farm dam within the development footprint.
- All stormwater treatment and Asset Protection Zones are to be located outside of the C2 zoned land.
- A Vegetation and Fauna Management Plan (VFMP) should be enacted over the retained land within the C2 zone, in order to mitigate for any vegetation and habitat loss within the development footprint. The VFMP will focus on removal of weeds and other exotic species to promote natural regeneration, detail requirements for the installation of supplementary fauna habitat (nest boxes), and specify monitoring requirements. Given the current condition of the proposed C2 land it is proposed that the VFMP should be able to reach 80% benchmark targets in 5-year time frame with an aim of improving biodiversity values within the remaining vegetation on the site.
- Ownership of the C2 land is recommended to be dedicated to LMCC on reaching the 80% benchmark targets.
- As mentioned above, nest boxes are to be installed within the C2 lands to mitigate for the loss of HBTs within the rezoning site. Supplementary nest boxes are to be installed inappropriate densities at a ratio of one hollow replaced for every hollow removed by the development within the C2 retained vegetation prior to any clearing works to provide additional roosting locations for any displaced fauna.
- Best practice erosion and sedimentation controls should be put in place prior to development to limit offsite movement of materials into the surrounding areas.
- Equipment should be cleaned thoroughly and disinfected before entering site to prevent weed and disease introduction such as exotic grasses, *Phytophthora cinnamomi* (Root-rot fungus), Frog *Chytrid* fungus and others.

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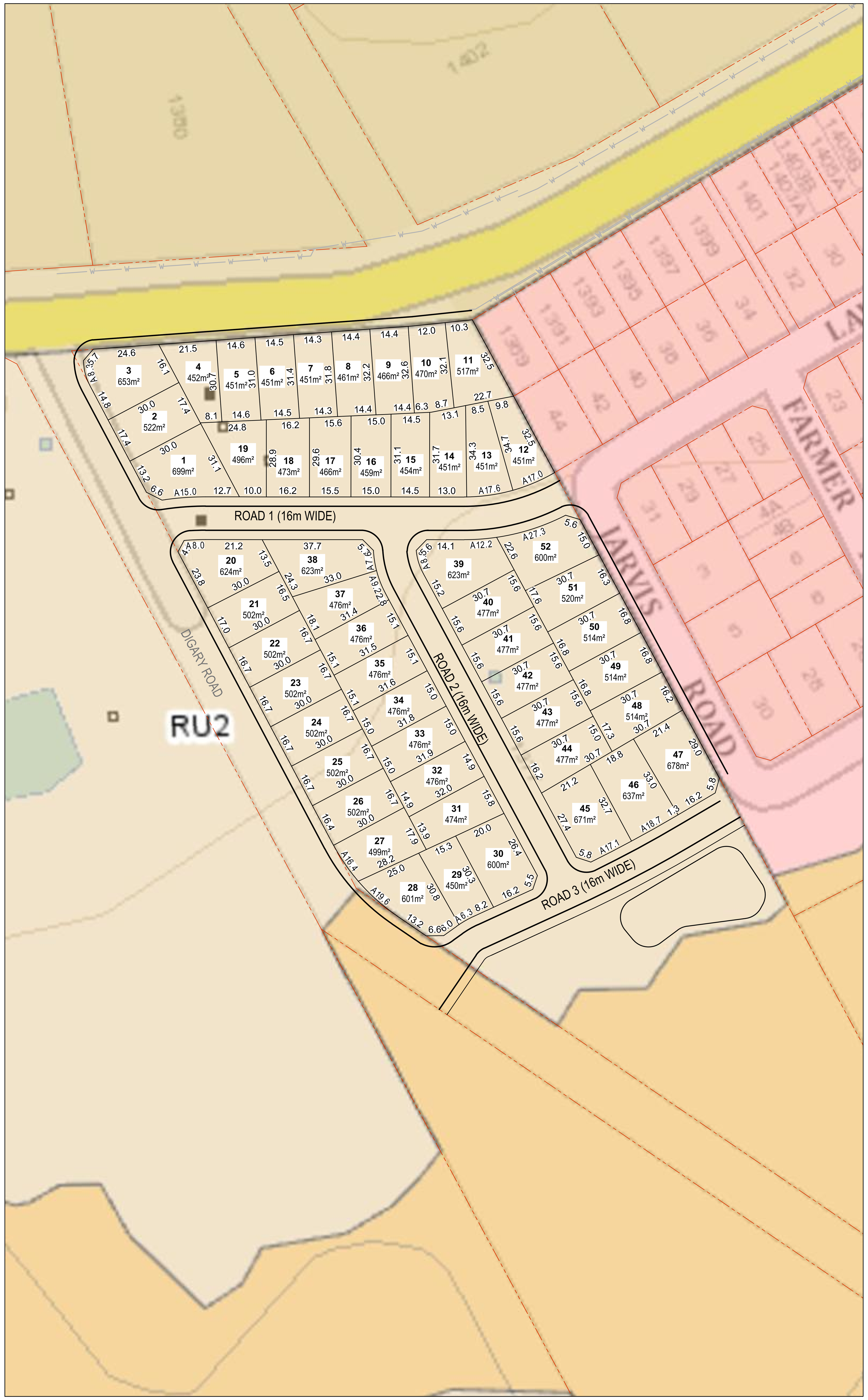
Appendix A – Planning Proposal

NORTH



LEGEND

EXISTING CADASTRAL	- - - - - -
PROPOSED LOT	————

ISSUED FOR INFORMATION

Rev	Drawn	Design	Appd.	Date	Revision Description
02	OS	PB	JP	27/04/2021	ISSUE FOR INFORMATION
01	PB	PB	-	21/04/2021	ISSUE FOR INFORMATION

Scale:
0 10 20 30 40 50 60 70 80 90 100
SCALE 1:1000 (A1) SCALE 1:2000 (A3)

For: NEWQUEST PROJECTS

By: Orion Consulting
CONSULT AUSTRALIA Member Firm
ABN:25 604 069 981 PO Box:7936, BAULKHAM HILLS NSW 2153 T:(02) 8660 0035 E:info@orionconsulting.com.au

Project: HUE HUE ROAD WYEE

Title: CONCEPT PLAN OF SUBDIVISION

Project No.	Set No.	Milestone	Plan	Revision
21-0089	02	SK	001	02

Appendix B – Flora Species List

FLORA SPECIES LIST

The following list includes all species of vascular plants observed on site during fieldwork. It should be noted that such a list cannot be considered comprehensive, but rather indicative of the flora present on the site. It can take many years of flora surveys to record all of the plant species occurring within any area, especially plant species that are only apparent in some seasons such as Orchids.

A number of species cannot always be accurately identified during a brief survey, generally due to a lack of suitable flowering and/or fruiting material. Any such species are identified as accurately as possible, and are indicated in the list as thus:

- specimens that could only be identified to genus level are indicated by the generic name followed by the abbreviation “sp.”, indicating an unidentified species of that genus;
- specimens for which identification of the genus was uncertain are indicated by a question mark (“?”) placed in front of the generic, which is followed by the abbreviation “sp.” and;
- specimens that could be accurately identified to genus level, but could be identified to species level with only a degree of certainty are indicated by a (“?”) placed in front of the epithet.

Authorities for the scientific names are not provided in the list. These follow the references outlined below.

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Names of families and higher taxa follow a modified Cronquist System (1981).

Introduced species are indicated by an asterisk “*”.

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

Family	Scientific Name	Common Name
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower
Apiaceae	*Centella asiatica*	Swamp Pennywort
Apiaceae	*Daucus carota**	Wild Carrot
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort
Apocynaceae	*Parsonsia straminea*	Common Silkpod
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern
Asteraceae	*Aster subulatus**	Wild Aster
Asteraceae	*Bidens pilosa**	Cobbler's Pegs
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane
Asteraceae	*Gamochaeta americana**	Cudweed
Apocynaceae	*Tylophora barbata*	Bearded Tylophora
Asteraceae	*Gamochaeta coarctata**	Cudweed
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed
Asteraceae	*Soliva sessilis**	Bindii
Asteraceae	*Taraxacum officinale**	Dandelion
Asteraceae	*Senecio madagascariensis**	Fireweed
Carophyllaceae	*Cerastium glomeratum**	Mouse-ear Chickweed
Bignoniaceae	*Pandorea pandorana*	Wonga Vine
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak
Celastraceae	*Denhamia silvestris*	Orange Bush
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew
Commelinaceae	*Tradescantia fluminensis**	Wandering Jew
Convolvulaceae	*Dichondra repens*	Kidney Weed
Cyperaceae	*Cyperus brevifolius**	Mullumbimby Couch
Cyperaceae	*Cyperus polystachyos*	
Cyperaceae	*Cyperus sesquiflorus**	
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-rush
Cyperaceae	*Schoenus melanostachys*	Black Bog Rush
Cyperaceae	*Gahnia microstachya*	
Cyperaceae	*Carex spp.*	
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge
Dennstaedtiaceae	*Pteridium esculentum*	Bracken
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower
Dioscoreaceae	*Dioscorea transversa*	Native Yam
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush
Fabaceae	*Glycine microphylla*	Small-leaf Glycine
Fabaceae	*Medicago spp.**	A Medic
Fabaceae	*Trifolium dubium**	Yellow Suckling Clover

Family	Scientific Name	Common Name
Fabaceae	*Trifolium repens**	White Clover
Fabaceae	*Trifolium spp.**	A Clover
Geraniaceae	*Geranium homeanum*	Northern Cranesbill
Goodeniaceae	*Goodenia hederacea*	Ivy Goodenia
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort
Juncaceae	*Juncus cognatus**	
Juncaceae	*Juncus spp.*	
Juncaceae	*Juncus usitatus*	Common Rush
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower
Lauraceae	*Cinnamomum camphora**	Camphor Laurel
Lindsaeaceae	*Lindsaea linearis*	Screw Fern
Lobeliaceae	*Lobelia purpurascens*	Whiteroot
Lobeliaceae	*Lobelia spp.*	
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily
Malvaceae	*Modiola caroliniana**	Red-flowered Mallow
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Myrtaceae	*Melaleuca linariifolia*	Snow in Summer
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle
Myrtaceae	*Angophora floribunda*	Rough-barked Apple
Myrtaceae	*Melaleuca sieberi*	
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush
Myrtaceae	*Angophora costata*	Smooth-barked Apple
Myrtaceae	*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum
Myrtaceae	*Eucalyptus pilularis*	Blackbutt
Myrtaceae	*Eucalyptus umbra*	Broad-leaved White Mahogany
Myrtaceae	*Eucalyptus punctata*	Grey Gum
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany
Myrtaceae	*Acmena smithii*	Lillypilly
Myrtaceae	*Corymbia gummifera*	Red Bloodwood
Myrtaceae	*Melaleuca decora*	White Feather Honeymyrtle
Myrtaceae	*Corymbia maculata*	Spotted Gum
Myrtaceae	*Syncarpia glomulifera*	Turpentine
Myrtaceae	*Eucalyptus globoidea*	White Stringybark
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive
Orchidaceae	*Cryptostylis spp.*	
Oxalidaceae	*Oxalis spp.*	
Phormiaceae	*Dianella caerulea var. producta*	Blue Flax Lily
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree
Phytolaccaceae	*Phytolacca octandra**	Inkweed
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn

Family	Scientific Name	Common Name
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Andropogon virginicus**	Whisky Grass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Oplismenus imbecillis*	
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Deyeuxia quadriseta*	Reed Bent Grass
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass
Poaceae	*Paspalidium distans*	
Poaceae	*Themeda triandra*	Kangaroo Grass
Poaceae	*Axonopus fissifolius**	Narrow-leaved Carpet Grass
Poaceae	*Cenchrus clandestinum**	Kikuyu
Poaceae	*Microlaena stipoides var. stipoides*	Weeping Rice Grass
Poaceae	*Oplismenus aemulus*	Basket Grass
Poaceae	*Cynodon spp.**	
Poaceae	*Ottochloa gracillima*	
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Festuca pratensis**	Meadow Fescue
Poaceae	*Setaria pumila**	Pale Pigeon Grass
Poaceae	*Sporobolus africanus**	Parramatta Grass
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass
Poaceae	*Poa affinis*	
Proteaceae	*Banksia oblongifolia*	Fern-leaf Banksia
Rosaceae	*Pyrus spp.**	Pear Tree
Rosaceae	*Rubus anglocandicans**	Blackberry
Rubiaceae	*Asperula spp.*	Woodruff
Rubiaceae	*Gynochthodes jasminoides*	Sweet Morinda
Rutaceae	*Zieria smithii*	Low growing form of Z. smithii, Diggers Head
Rutaceae	*Acronychia oblongifolia*	White Aspen
Smilacaceae	*Smilax australis*	Lawyer Vine
Verbenaceae	*Lantana camara**	Lantana
Verbenaceae	*Verbena bonariensis**	Purpletop
Verbenaceae	*Verbena litoralis**	
Vitaceae	*Cissus hypoglauca*	Water Vine
Xanthorrhoeaceae	*Xanthorrhoea spp.*	

Appendix C – Expected Fauna Species List

EXPECTED FAUNA SPECIES LIST

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

"●" – species observed or indicated by scats, tracks etc. on, over or near the site during recent surveys by AEP (2019, 2020, 2021).

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

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Amphibians			
Myobatrachidae	H, SM (All records in conservation Area)	*Crinia signifera*	Common Eastern Froglet
Myobatrachidae		*Limnodynastes peronii*	Brown-striped Frog
Myobatrachidae		*Limnodynastes tasmaniensis*	Spotted Grass Frog
Myobatrachidae	H, SM (All records in conservation Area)	*Pseudophryne coriacea*	Red-backed Toadlet
Myobatrachidae	SM (All records in conservation Area)	*Uperoleia fusca*	Dusky Toadlet
Myobatrachidae		*Uperoleia laevigata*	Smooth Toadlet
Hylidae		*Litoria dentata*	Bleating Tree Frog
Hylidae	SM (All records in conservation Area)	*Litoria fallax*	Eastern Dwarf Tree Frog
Hylidae		*Litoria freycineti*	Freycinet's Frog
Hylidae		*Litoria latopalmata*	Broad-palmed Frog
Hylidae		*Litoria nasuta*	Rocket Frog
Hylidae		*Litoria peronii*	Peron's Tree Frog
Hylidae		*Litoria revelata*	Revealed Frog
Hylidae		*Litoria tyleri*	Tyler's Tree Frog
Hylidae		*Litoria verreauxii*	Verreaux's Frog
Reptiles			
Chelidae		*Chelodina longicollis*	Eastern Snake-necked Turtle
Pygopodidae		*Pygopus lepidopodus*	Common Scaly-foot
Scincidae		*Bellatorias major*	Land Mullet
Scincidae		*Cryptoblepharus virgatus*	Cream-striped Shining-skink
Scincidae		*Ctenotus robustus*	Robust Ctenotus
Scincidae		*Ctenotus taeniolatus*	Copper-tailed Skink
Scincidae		*Cyclodomorphus michaeli*	Mainland She-oak Skink
Scincidae		*Eulamprus quoyii*	Eastern Water-skink
Scincidae		*Eulamprus tenuis*	Barred-sided Skink

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Scincidae		*Lampropholis delicata*	Dark-flecked Garden Sunskink
Scincidae		*Lampropholis guichenoti*	Pale-flecked Garden Sunskink
Scincidae	O	*Lampropholis sp.*	Grass Skink
Scincidae		*Tiliqua scincoides*	Eastern Blue-tongue
Agamidae		*Amphibolurus muricatus*	Jacky Lizard
Agamidae		*Intellagama lesueurii*	Eastern Water Dragon
Agamidae		*Pogona barbata*	Bearded Dragon
Varanidae		*Varanus gouldii*	Gould's Goanna
Varanidae		*Varanus varius*	Lace Monitor
Typhlopidae		*Anilios nigrescens*	Blackish Blind Snake
Colubridae	O	*Dendrelaphis punctulatus*	Common Tree Snake
Elapidae		*Acanthophis antarcticus*	Common Death Adder
Elapidae		*Cacophis squamulosus*	Golden-crowned Snake
Elapidae		*Cryptophis nigrescens*	Eastern Small-eyed Snake
Elapidae		*Demansia psammophis*	Yellow-faced Whip Snake
Elapidae		*Hemiaspis signata*	Black-bellied Swamp Snake
Elapidae		*Pseudechis porphyriacus*	Red-bellied Black Snake
Elapidae		*Pseudonaja textilis*	Eastern Brown Snake
Birds			
Anatidae		*Anas castanea*	Chestnut Teal
Anatidae		*Anas platyrhynchos**	Mallard
Anatidae		*Anas superciliosa*	Pacific Black Duck
Anatidae	O	*Chenonetta jubata*	Australian Wood Duck
Columbidae		*Columba livia*	Rock Dove
Columbidae		*Geopelia humeralis*	Bar-shouldered Dove
Columbidae		*Geopelia striata*	Peaceful Dove
Columbidae		*Leucosarcia melanoleuca*	Wonga Pigeon
Columbidae		*Lopholaimus antarcticus*	Topknot Pigeon
Columbidae		*Ocyphaps lophotes*	Crested Pigeon

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Columbidae		*Phaps chalcoptera*	Common Bronzewing
Columbidae		*Phaps elegans*	Brush Bronzewing
Columbidae		*Streptopelia chinensis**	Spotted Turtle-Dove
Podargidae		*Podargus strigoides*	Tawny Frogmouth
Aegothelidae		*Aegotheles cristatus*	Australian Owlet-nightjar
Apodidae		*Hirundapus caudacutus*	White-throated Needletail
Phalacrocoracidae		*Microcarbo melanoleucos*	Little Pied Cormorant
Phalacrocoracidae		*Phalacrocorax carbo*	Great Cormorant
Phalacrocoracidae		*Phalacrocorax sulcirostris*	Little Black Cormorant
Phalacrocoracidae		*Phalacrocorax varius*	Pied Cormorant
Ardeidae		*Ardea ibis*	Cattle Egret
Ardeidae		*Ardea intermedia*	Intermediate Egret
Ardeidae		*Ardea modesta*	Eastern Great Egret
Ardeidae	O, SM	*Ardea pacifica*	White-necked Heron
Ardeidae		*Egretta garzetta*	Little Egret
Ardeidae	O	*Egretta novaehollandiae*	White-faced Heron
Threskiornithidae		*Platalea regia*	Royal Spoonbill
Threskiornithidae	H	*Threskiornis molucca*	Australian White Ibis
Threskiornithidae		*Threskiornis spinicollis*	Straw-necked Ibis
Accipitridae		*Accipiter cirrocephalus*	Collared Sparrowhawk
Accipitridae		*Accipiter fasciatus*	Brown Goshawk
Accipitridae		*Accipiter novaehollandiae*	Grey Goshawk
Accipitridae		*Aviceda subcristata*	Pacific Baza
Accipitridae		*Circus approximans*	Swamp Harrier
Accipitridae		*Elanus axillaris*	Black-shouldered Kite
Accipitridae		*Haliastur sphenurus*	Whistling Kite
Falconidae		*Falco berigora*	Brown Falcon
Falconidae		*Falco cenchroides*	Nankeen Kestrel
Falconidae		*Falco peregrinus*	Peregrine Falcon
Rallidae		*Fulica atra*	Eurasian Coot
Rallidae		*Gallirallus philippensis*	Buff-banded Rail

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Rallidae	O, SM	*Porphyrio porphyrio*	Purple Swamphen
Charadriidae	H, SM	*Vanellus miles*	Masked Lapwing
Turnicidae		*Turnix varius*	Painted Button-quail
Cacatuidae	O, H, SM	*Cacatua galerita*	Sulphur-crested Cockatoo
Cacatuidae		*Cacatua sanguinea*	Little Corella
Cacatuidae		*Cacatua tenuirostris*	Long-billed Corella
Cacatuidae		*Calyptorhynchus funereus*	Yellow-tailed Black-Cockatoo
Cacatuidae		*Eolophus roseicapillus*	Galah
Psittacidae		*Alisterus scapularis*	Australian King-Parrot
Psittacidae		*Glossopsitta concinna*	Musk Lorikeet
Psittacidae		*Platycercus elegans*	Crimson Rosella
Psittacidae	O, H, SM	*Platycercus eximius*	Eastern Rosella
Psittacidae		*Trichoglossus chlorolepidotus*	Scaly-breasted Lorikeet
Psittacidae	H, SM	*Trichoglossus haematodus*	Rainbow Lorikeet
Centropodidae		*Centropus phasianinus*	Pheasant Coucal
Cuculidae		*Cacomantis flabelliformis*	Fan-tailed Cuckoo
Cuculidae		*Chalcites basalis*	Horsfield's Bronze-Cuckoo
Cuculidae	O, H, SM	*Chalcites lucidus*	Shining Bronze-Cuckoo
Cuculidae		*Eudynamys orientalis*	Eastern Koel
Cuculidae		*Scythrops novaehollandiae*	Channel-billed Cuckoo
Strigidae		*Ninox novaeseelandiae*	Southern Boobook
Tytonidae		*Tyto javanica*	Eastern Barn Owl
Alcedinidae	H, SM	*Dacelo novaeguineae*	Laughing Kookaburra
Alcedinidae		*Todiramphus sanctus*	Sacred Kingfisher
Coraciidae		*Eurystomus orientalis*	Dollarbird
Climacteridae	O	*Cormobates leucophaea*	White-throated Treecreeper
Ptilonorhynchidae		*Ptilonorhynchus violaceus*	Satin Bowerbird
Maluridae		*Malurus cyaneus*	Superb Fairy-wren
Maluridae	O, H	*Malurus lamberti*	Variegated Fairy-wren

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Maluridae		*Stipiturus malachurus*	Southern Emu-wren
Acanthizidae		*Acanthiza lineata*	Striated Thornbill
Acanthizidae		*Acanthiza nana*	Yellow Thornbill
Acanthizidae	H	*Acanthiza pusilla*	Brown Thornbill
Acanthizidae	H	*Gerygone mouki*	Brown Gerygone
Acanthizidae		*Gerygone olivacea*	White-throated Gerygone
Acanthizidae	H, SM	*Sericornis frontalis*	White-browed Scrubwren
Pardalotidae	SM	*Pardalotus punctatus*	Spotted Pardalote
Pardalotidae	SM	*Pardalotus striatus*	Striated Pardalote
Meliphagidae		*Acanthorhynchus tenuirostris*	Eastern Spinebill
Meliphagidae	H, O, SM	*Anthochaera carunculata*	Red Wattlebird
Meliphagidae		*Anthochaera chrysoptera*	Little Wattlebird
Meliphagidae		*Caligavis chrysops*	Yellow-faced Honeyeater
Meliphagidae		*Lichmera indistincta*	Brown Honeyeater
Meliphagidae	O, H, SM	*Manorina melanocephala*	Noisy Miner
Meliphagidae		*Manorina melanophrys*	Bell Miner
Meliphagidae	SM	*Meliphaga lewinii*	Lewin's Honeyeater
Meliphagidae		*Melithreptus brevirostris*	Brown-headed Honeyeater
Meliphagidae		*Melithreptus lunatus*	White-naped Honeyeater
Meliphagidae	H	*Myzomela sanguinolenta*	Scarlet Honeyeater
Meliphagidae	H	*Philemon corniculatus*	Noisy Friarbird
Meliphagidae		*Phylidonyris niger*	White-cheeked Honeyeater
Meliphagidae		*Phylidonyris novaehollandiae*	New Holland Honeyeater
Meliphagidae		*Plectorhyncha lanceolata*	Striped Honeyeater
Psophodidae	H, SM	*Psophodes olivaceus*	Eastern Whipbird
Campephagidae	H	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike
Campephagidae		*Coracina tenuirostris*	Cicadabird
Pachycephalidae	H	*Colluricincla harmonica*	Grey Shrike-thrush
Pachycephalidae	SM	*Pachycephala pectoralis*	Golden Whistler

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Pachycephalidae		*Pachycephala rufiventris*	Rufous Whistler
Oriolidae		*Oriolus sagittatus*	Olive-backed Oriole
Oriolidae		*Sphecotheres vieilloti*	Australasian Figbird
Artamidae		*Artamus leucorynchus*	White-breasted Woodswallow
Artamidae		*Cracticus nigrogularis*	Pied Butcherbird
Artamidae	O, H, SM	*Cracticus tibicen*	Australian Magpie
Artamidae	H, SM	*Cracticus torquatus*	Grey Butcherbird
Artamidae	H, SM	*Strepera graculina*	Pied Currawong
Rhipiduridae	H, SM	*Rhipidura albiscapa*	Grey Fantail
Rhipiduridae	O, H	*Rhipidura leucophrys*	Willie Wagtail
Rhipiduridae		*Rhipidura rufifrons*	Rufous Fantail
Corvidae	H	*Corvus coronoides*	Australian Raven
Monarchidae	O	*Grallina cyanoleuca*	Magpie-lark
Monarchidae		*Myiagra rubecula*	Leaden Flycatcher
Petroicidae	H	*Eopsaltria australis*	Eastern Yellow Robin
Petroicidae		*Microeca fascinans*	Jacky Winter
Petroicidae		*Petroica rosea*	Rose Robin
Cisticolidae		*Cisticola exilis*	Golden-headed Cisticola
Acrocephalidae		*Acrocephalus australis*	Australian Reed-Warbler
Megaluridae		*Megalurus timoriensis*	Tawny Grassbird
Timaliidae	SM	*Zosterops lateralis*	Silvereye
Hirundinidae	O, H	*Hirundo neoxena*	Welcome Swallow
Hirundinidae		*Petrochelidon ariel*	Fairy Martin
Hirundinidae		*Petrochelidon nigricans*	Tree Martin
Pycnonotidae		*Pycnonotus jocosus**	Red-whiskered Bulbul
Sturnidae	O, H, SM	*Sturnus tristis**	Common Myna
Sturnidae		*Sturnus vulgaris**	Common Starling
Nectariniidae		*Dicaeum hirundinaceum*	Mistletoebird
Estrildidae		*Neochmia temporalis*	Red-browed Finch
Passeridae		*Passer domesticus**	House Sparrow

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Mammals			
Tachyglossidae		*Tachyglossus aculeatus*	Short-beaked Echidna
Dasyuridae	CT (2)	*Antechinus stuartii*	Brown Antechinus
Dasyuridae		*Antechinus swainsonii*	Dusky Antechinus
Equidae		*Equus caballus**	Horse
Peramelidae		*Isoodon macrourus*	Northern Brown Bandicoot
Peramelidae		*Perameles nasuta*	Long-nosed Bandicoot
Petauridae	CT (2)	*Petaurus breviceps*	Sugar Glider
Petauridae		***Petaurus norfolcensis***	**Squirrel Glider**
Pseudocheiridae		*Pseudocheirus peregrinus*	Common Ringtail Possum
Acrobatidae		*Acrobates pygmaeus*	Feathertail Glider
Phalangeridae	O, CT (2)	*Trichosurus vulpecula*	Common Brushtail Possum
Macropodidae	O	*Macropus giganteus*	Eastern Grey Kangaroo
Macropodidae		*Macropus rufogriseus*	Red-necked Wallaby
Macropodidae		*Wallabia bicolor*	Swamp Wallaby
Pteropodidae	H	***Pteropus poliocephalus***	**Grey-headed Flying-fox**
Molossidae		*Austronomus australis*	White-striped Freetail-bat
Molossidae		*Mormopterus norfolkensis*	Eastern Freetail-bat
Molossidae		*Mormopterus planiceps*	Little Mastiff-bat
Molossidae		*Mormopterus ridei*	Eastern Free-tailed Bat
Vespertilionidae		*Chalinolobus gouldii*	Gould's Wattled Bat
Vespertilionidae		*Chalinolobus morio*	Chocolate Wattled Bat
Vespertilionidae		***Myotis macropus***	**Southern Myotis**
Vespertilionidae		*Nyctophilus geoffroyi*	Lesser Long-eared Bat
Vespertilionidae		*Nyctophilus gouldi*	Gould's Long-eared Bat
Vespertilionidae		*Scotorepens orion*	Eastern Broad-nosed Bat
Vespertilionidae		*Vespadelus pumilus*	Eastern Forest Bat
Vespertilionidae		*Vespadelus regulus*	Southern Forest Bat
Vespertilionidae		*Vespadelus vulturnus*	Little Forest Bat
Muridae		*Melomys burtoni*	Grassland Melomys
Muridae		*Rattus lutreolus*	Swamp Rat

Family Name	Observed (O) / Heard (H)/ Scat (SC) / Track (T) Marking (M), Nest (N), Camera Trap (CT) Anabat (A), Songmeter (SM)	Scientific Name	Common Name
Canidae		*Canis lupus**	Dingo, domestic dog

Appendix D – Site Photographs

Grazed paddock within proposed development area looking south to retained C2 lands and Mannering Creek.

Large Hollow Bearing Tree (*Angophora costata*) within C2 lands

Sugar Glider Camera Trap 2 22/07/2022

Brush Tail Possum Camera Trap 2 22/07/2022

Brown Antechinus Camera Trap 2 22/07/2022

Appendix E – Rainfall Data 2022

Daily Rainfall (millimetres)

COORANBONG (AVONDALE)

Station Number: 061012 · State: NSW · Opened: 1903 · Status: Open · Latitude: 33.09°S · Longitude: 151.46°E · Elevation: 10 m

2022	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1st	0	0	26.0	5.0	3.0	0						
2nd	0	2.0	21.0	0	0							
3rd	0	18.0	76.0	0	0							
4th	1.0	12.0	24.0	0	0							
5th	6.0	9.0	15.0	0	2.0							
6th	14.0	17.0	30.0	0	9.0							
7th	0	12.0	9.0	1.0	0							
8th	20.0	3.0	51.0	66.0	1.0							
9th	14.0	0	26.0	7.0	0							
10th	0	0	0	3.0	5.0							
11th	0	0	0	0	14.0							
12th	0	53.0	0	0	15.0							
13th	0	0	0	9.0	5.0							
14th	16.0	0	0	6.0	5.0							
15th	0	0	0	0	0							
16th	12.0	0	3.0	0	1.0							
17th	0	0	0	0	0							
18th	0	12.0	0	0	0							
19th	44.0	2.0	5.0	0	0							
20th	13.0	0	12.0	2.0	2.0							
21st	0	0	0	0	2.0							
22nd	0	1.0	0	7.0	2.0							
23rd	0	54.0	0	4.0	24.0							
24th	7.0	17.0	13.0	5.0	6.0							
25th	0	4.0	18.0	1.0	5.0							
26th	0	8.0	2.0	1.0	0							
27th	0	9.0	8.0	0	1.0							
28th	0	9.0	12.0	1.0	0							
29th	0		31.0	3.0	0							
30th	0		30.0	0	0							
31st	0		27.0		5.0							
Highest daily	44.0	54.0	76.0	66.0	24.0	0						
Monthly Total	147.0	242.0	439.0	121.0	107.0							

↓ This day is part of an accumulated total
Quality control: 12.3 Done & acceptable, 12.3 Not completed or unknown

Product code: IDCJAC0009 reference: 86446773

Australian Government
Bureau of Meteorology

Daily Rainfall (millimetres)

COORANBONG (AVONDALE)

Station Number: 061012 · State: NSW · Opened: 1903 · Status: Open · Latitude: 33.09°S · Longitude: 151.46°E · Elevation: 10 m

Statistics for this station calculated over all years of data

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	108.9	135.4	128.1	117.1	93.9	102.6	67.5	59.9	58.3	68.7	81.8	96.6
Median	84.5	98.4	112.0	83.6	66.2	70.0	43.5	35.3	43.6	46.9	69.6	73.8
Highest daily	154.2	*233.0*	147.1	221.0	138.4	201.0	144.8	187.2	177.8	86.6	*126.0*	158.5
Date of highest daily	22nd 1924	28th 2014	25th 1926	16th 1927	28th 1931	9th 2007	7th 1931	14th 1952	12th 1950	18th 1914	18th 2013	29th 1926

1) Calculation of statistics

Summary statistics, other than the Highest and Lowest values, are only calculated if there are at least 20 years of data available.

2) Gaps and missing data

Gaps may be caused by a damaged instrument, a temporary change to the site operation, or due to the absence or illness of an observer.

3) Further information

http://www.bom.gov.au/climate/cdo/about/about-rain-data.shtml.

Product code: IDCJAC0009 reference: 86446773 Created on Mon 06 Jun 2022 17:23:41 PM AEST

Appendix F – BAM Field Data

Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	HBTs	Other
Acanthaceae	*Pseuderanthemum variabile*	Pastel Flower	Forb		0.1						
Apiaceae	*Centella asiatica*	Swamp Pennywort	Forb					0.2	0.2		
Apiaceae	*Daucus carota**	Wild Carrot	nil - exotic					0.1			
Adiantaceae	*Adiantum aethiopicum*	Common Maidenhair	Fern and fern allies		0.1						
Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	Forb		1						
Apocynaceae	*Parsonsia straminea*	Common Silkpod	Vine		0.2	0.3		4			
Asparagaceae	*Asparagus aethiopicus**	Asparagus Fern	nil - exotic					1			
Asteraceae	*Aster subulatus**	Wild Aster	nil - exotic				0.1		0.1		
Asteraceae	*Bidens pilosa**	Cobbler's Pegs	nil - exotic					0.3			
Asteraceae	*Conyza bonariensis**	Flax-leaf Fleabane	nil - exotic					0.1	0.1		
Asteraceae	*Gamochaeta americana**	Cudweed	nil - exotic				0.3	0.3	0.3		
Apocynaceae	*Tylophora barbata*	Bearded Tylophora	Vine		0.2						
Asteraceae	*Gamochaeta coarctata**	Cudweed	nil - exotic	20							
Asteraceae	*Hypochaeris radicata**	Flatweed	nil - exotic	0.5			0.5	0.3	0.5		
Asteraceae	*Sigesbeckia orientalis subsp. orientalis*	Indian Weed	Forb					0.3			
Asteraceae	*Soliva sessilis**	Bindii	nil - exotic						0.1		
Asteraceae	*Taraxacum officinale**	Dandelion	nil - exotic					0.1			
Asteraceae	*Senecio madagascariensis**	Fireweed	nil - exotic	0.1			0.1	0.2	1		
Carophyllaceae	*Cerastium glomeratum**	Mouse-ear Chickweed	nil - exotic					0.1			
Bignoniaceae	*Pandorea pandorana*	Wonga Vine	Vine		0.1						
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak	Tree		1	0.2					1
Celastraceae	*Denhamia silvestris*	Orange Bush			0.1						
Commelinaceae	*Commelina cyanea*	Forb	Forb (FG)	0.1				0.5			
Commelinaceae	*Tradescantia fluminensis**	Wandering Jew	nil - exotic		5						
Convolvulaceae	*Dichondra repens*	Kidney Weed	Forb		0.1			0.2	0.5		

Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	HBTs	Other
Cyperaceae	*Cyperus brevifolius**	Mullumbimby Couch	nil - exotic				2	0.1	0.2		
Cyperaceae	*Cyperus polystachyos*		Sedge	0.2			10				
Cyperaceae	*Cyperus sesquiflorus**		nil - exotic				1				
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-rush	Sedge					0.1			
Cyperaceae	*Schoenus melanostachys*	Black Bog Rush	Sedge			0.2					
Cyperaceae	*Gahnia microstachya*		Sedge					0.5			
Cyperaceae	*Carex spp.*		Sedge		0.1				0.3		
Cyperaceae	*Gahnia clarkei*	Tall Saw-sedge	Sedge		1	5		3	0.3		
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	Sedge		0.1			0.3			
Dennstaedtiaceae	*Pteridium esculentum*	Bracken	Fern and fern allies		0.1						
Dicksoniaceae	*Calochlaena dubia*	Rainbow Fern	Tree fern		1						
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	Shrub		0.1						
Dilleniaceae	*Hibbertia scandens*	Climbing Guinea Flower	Vine		0.1	0.1					
Dioscoreaceae	*Dioscorea transversa*	Native Yam	Vine		0.2						
Euphorbiaceae	*Breynia oblongifolia*	Coffee Bush	Shrub		0.1	0.1					
Fabaceae	*Glycine microphylla*	Small-leaf Glycine	Vine						0.2		
Fabaceae	*Medicago spp.**	A Medic	nil - exotic						0.1		
Fabaceae	*Trifolium dubium**	Yellow Suckling Clover	nil - exotic						0.1		
Fabaceae	*Trifolium repens**	White Clover	nil - exotic				5	0.2	1		
Fabaceae	*Trifolium spp.**	A Clover	nil - exotic	5							
Geraniaceae	*Geranium homeanum*	Northern Cranesbill	Forb					0.2	0.1		
Goodeniaceae	*Goodenia hederacea*	Ivy Goodenia				0.5					
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort	Forb			0.1					
Juncaceae	*Juncus cognatus**		nil - exotic	0.7			3	0.2	2		
Juncaceae	*Juncus spp.*		Rush						0.3		

Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	HBTs	Other
Juncaceae	*Juncus usitatus*	Common Rush	Rush						0.5		
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower	Forb		0.1						
Lauraceae	*Cinnamomum camphora**	Camphor Laurel	nil - exotic		0.1						
Lindsaeaceae	*Lindsaea linearis*	Screw Fern	Fern and fern allies			0.1					
Lobeliaceae	*Lobelia purpurascens*	Whiteroot	Forb		0.1			0.5	0.1		
Lobeliaceae	*Lobelia spp.*		Forb			0.5					
Lomandraceae	*Lomandra longifolia*	Spiky-headed Mat-rush	Rush		10	20		0.2			
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	Vine		0.1						
Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	Vine		0.1						
Malvaceae	*Modiola caroliniana**	Red-flowered Mallow	nil - exotic						0.2		
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	nil - exotic					0.3	0.3		
Myrtaceae	*Melaleuca linariifolia*	Snow in Summer	Shrub			2					
Myrtaceae	*Melaleuca nodosa*	Ball Honey Myrtle	Shrub			5		10			
Myrtaceae	*Angophora floribunda*	Rough-barked Apple	Tree								1
Myrtaceae	*Melaleuca sieberi*		Shrub			2		2			
Myrtaceae	*Callistemon salignus*	Willow Bottlebrush	Shrub		5	10		3	15		
Myrtaceae	*Angophora costata*	Smooth-barked Apple	Tree					20	5		1
Myrtaceae	*Eucalyptus haemastoma*	Broad-leaved Scribbly Gum	Tree								1
Myrtaceae	*Eucalyptus pilularis*	Blackbutt	Tree								1
Myrtaceae	*Eucalyptus umbra*	Broad-leaved White Mahogany	Tree								1
Myrtaceae	*Eucalyptus punctata*	Grey Gum	Tree					2			
Myrtaceae	*Eucalyptus resinifera*	Red Mahogany	Tree					5	15		
Myrtaceae	*Acmena smithii*	Lillypilly	Tree		10				5		
Myrtaceae	*Corymbia gummifera*	Red Bloodwood	Tree		2			3			
Myrtaceae	*Melaleuca decora*	White Feather Honeymyrtle	Shrub					0.3			

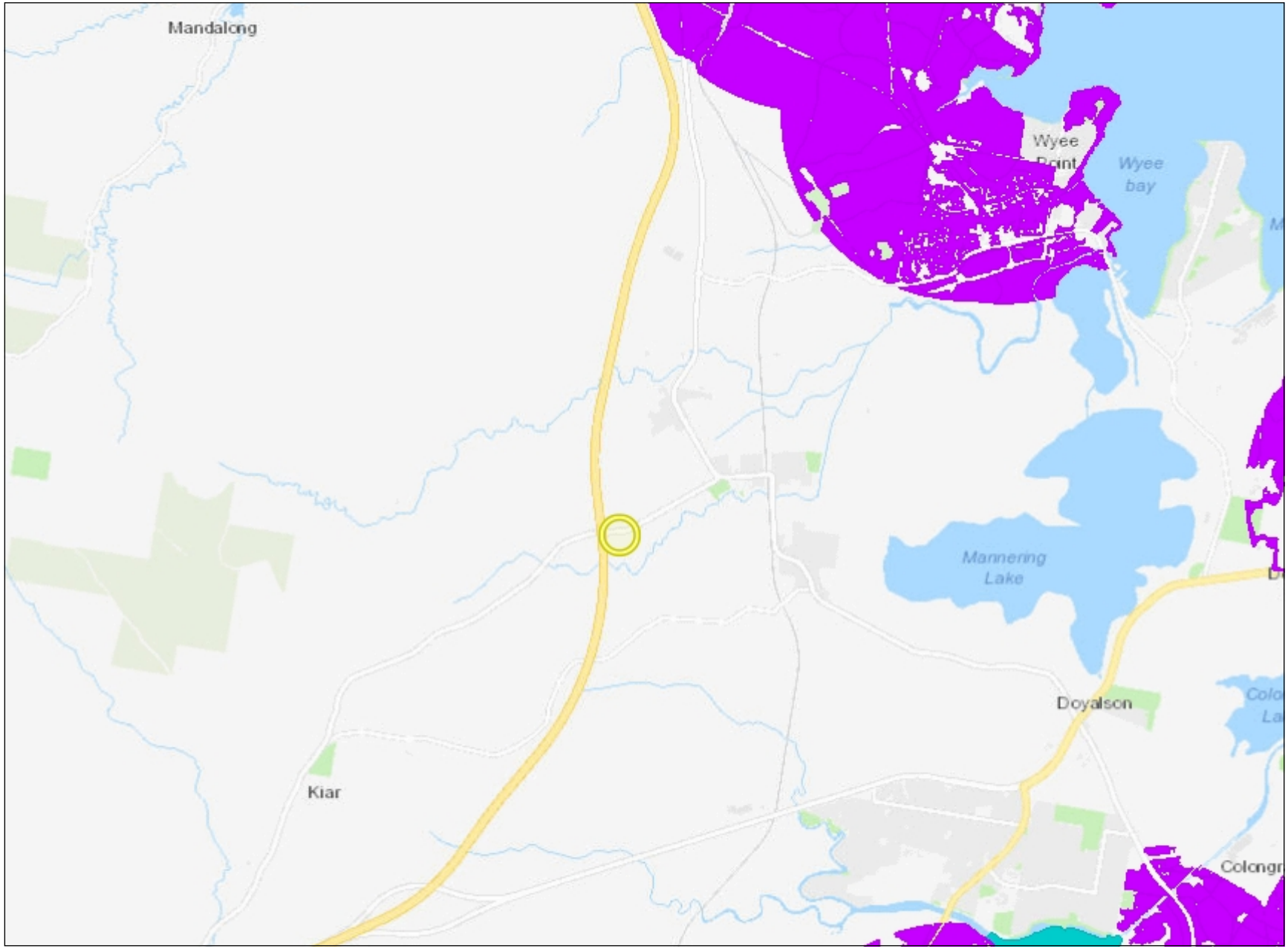
Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	HBTs	Other
Myrtaceae	*Corymbia maculata*	Spotted Gum	Tree		25						
Myrtaceae	*Syncarpia glomulifera*	Turpentine	Tree		15						1
Myrtaceae	*Eucalyptus globoidea*	White Stringybark	Tree		2	5					
Myrtaceae	*Eucalyptus robusta*	Swamp Mahogany	Tree			10					
Oleaceae	*Notelaea longifolia*	Mock Olive, Large Mock-olive	Tree		1	0.5					
Orchidaceae	*Cryptostylis spp.*		Forb			0.1					
Oxalidaceae	*Oxalis spp.*								0.1		
Phormiaceae	*Dianella caerulea var. producta*	Blue Flax Lily	Forb		0.2	5		0.1			
Phyllanthaceae	*Glochidion ferdinandi var. ferdinandi*	Cheese Tree	Tree		5	1		0.5	2		
Phytolaccaceae	*Phytolacca octandra**	Inkweed	nil - exotic					0.2			
Pittosporaceae	*Pittosporum multiflorum*	Orange Thorn	Shrub		0.1						
Pittosporaceae	*Pittosporum revolutum*	Yellow Pittosporum	Shrub		0.3			0.5			
Plantaginaceae	*Plantago lanceolata**	Ribwort	nil - exotic	10			0.1	0.1	0.2		
Poaceae	*Andropogon virginicus**	Whisky Grass	nil - exotic						5		
Poaceae	*Microlaena stipoides*	Weeping Grass	Other Grass		20				0.2		
Poaceae	*Oplismenus imbecillis*		Other Grass		20						
Poaceae	*Cynodon dactylon*	Common Couch	Other Grass				5		5		
Poaceae	*Imperata cylindrica*	Blady Grass	Tussock Grass			2		2			
Poaceae	*Deyeuxia quadriseta*	Reed Bent Grass	Tussock Grass				1				
Poaceae	*Dichelachne micrantha*	Short-hair Plume Grass	Tussock Grass						0.3		
Poaceae	*Paspalidium distans*		Tussock Grass			0.1		5			
Poaceae	*Themeda triandra*	Kangaroo Grass	Tussock Grass			15					
Poaceae	*Axonopus fissifolius**	Narrow-leaved Carpet Grass	nil - exotic	25			60	15	55		
Poaceae	*Cenchrus clandestinum**	Kikuyu	nil - exotic	15			0.5		3		
Poaceae	*Microlaena stipoides var. stipoides*	Weeping Rice Grass	Tussock Grass					1			

Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	HBTs	Other
Poaceae	*Oplismenus aemulus*	Basket Grass	Other Grass					35			
Poaceae	*Cynodon spp.**		nil - exotic	15							
Poaceae	*Ottochloa gracillima*		Other Grass					10			
Poaceae	*Entolasia stricta*	Wiry Panic	Tussock Grass		0.1	5		0.5			
Poaceae	*Paspalum dilatatum**	Paspalum	nil - exotic				0.5		0.3		
Poaceae	*Festuca pratensis**	Meadow Fescue	nil - exotic	5							
Poaceae	*Setaria pumila**	Pale Pigeon Grass	nil - exotic					0.2	1		
Poaceae	*Sporobolus africanus**	Parramatta Grass	nil - exotic				0.3				
Poaceae	*Stenotaphrum secundatum**	Buffalo Grass	nil - exotic				5		3		
Poaceae	*Poa affinis*		Tussock Grass		20						
Proteaceae	*Banksia oblongifolia*	Fern-leaf Banksia	Shrub			2					
Rosaceae	*Pyrus spp.**	Pear Tree	nil - exotic					0.5			
Rosaceae	*Rubus anglocandicans**	Blackberry	nil - exotic					0.3	0.3		
Rubiaceae	*Asperula spp.*	Woodruff	Forb		0.1						
Rubiaceae	*Gynochthodes jasminoides*	Sweet Morinda	Vine		0.2						
Rutaceae	*Zieria smithii*	Low growing form of Z. smithii, Diggers Head		Shrub (SG)		0.3	0.1				
Rutaceae	*Acronychia oblongifolia*	White Aspen	Shrub		5						
Smilacaceae	*Smilax australis*	Lawyer Vine	Vine		0.5	0.1					
Verbenaceae	*Lantana camara**	Lantana	nil - exotic		0.1						
Verbenaceae	*Verbena bonariensis**	Purpletop	nil - exotic						0.3		
Verbenaceae	*Verbena litoralis**		nil - exotic						0.2		
Vitaceae	*Cissus hypoglauca*	Water Vine	Vine		2						
Xanthorrhoeaceae	*Xanthorrhoea spp.*		Xanthorrhoea		0.1						

Appendix G – Important Areas Map

Planning, Industry & Environment

2389 Swift Parrot Mapping



Legend

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

0 2.8 5.5 11.0

Kilometres

Map Created 2:08 PM 6/6/2022

Appendix H – Author CVs

Andrew Harker

Curriculum Vitae

Andrew works with AEP in the role of Ecologist. He graduated with a Bachelor of Environmental Science and Management, majoring in Earth Systems. Whilst studying at the University of Newcastle he conducted tailored his degree to focus on conservation biology and environmental remediation. Andrew gained experience in a range of ecological field studies as a requirement of his degree courses. Working with Enviropacific Services he gained further experience in ecological field surveys as a graduate environmental scientist working on environmental remediation projects in the civil construction sector. He has experience in bushfire threat assessments, targeted fauna and flora surveys, Koala Spot Assessment Technique (SAT) surveys, fauna handling and tree surveys. Andrew also has extensive experience in the civil construction sector in large scale remediation projects, residential developments, excavation and trades.

Qualifications

- Bachelor of Environmental Science and Management – University of Newcastle (2017)
- Masters Degree in Disaster Resilience and Sustainable Development (2019 – current)
- Diploma of Public Safety (Royal Australian Air Force 2012)
- Diploma of Management (Royal Australian Air Force 2009)
- Cert IV in Training & Assessment (Royal Australian Air Force 2010)
- Cert II in Civil Construction
    - FPIFGM069A – Trim & Cross-cut Felled Tree
    - FPIFGM111A – Fall Trees Manually – Intermediate

Licences/Certificates

- Apply First Aid
- Class HC NSW Drivers Licence
- Light & Heavy 4WD, ATV
- Construction White Card
- PADI Open Water; Advanced Diver; Rescue Diver
- Backhoe/Loader & Forklift
- Bush Firefighter (BF 2003)

Field Survey Experience

- Aquatic & marine water quality surveys, sampling and analysis
- Terrestrial fauna survey, including koala SAT surveys and spotlighting
- Bushfire Treat Assessments

Volunteer Experience

- NSW Rural Fire Service

Employment History

Mar 2021 – Current	**Ecologist**
	Anderson Environment & Planning, Newcastle
Sep 2018 – Mar 2021	**Water Treatment Specialist**
	Water Treatment Services Australia
Nov 2017 – Apr 2019	**Graduate Environmental Scientist / Engineer**
	Enviropacific Services
Oct 1995 – Sep 2012	**Aircraft/Armament Technician/Manager**
	Royal Australian Air Force

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 Special Competence

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

Relevant Employment History

2019-present **Ecologist**

Anderson Environmental 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.

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.

Certification

- 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 Special 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.

Employment History

2019 to present AEP Senior Environmental Manager

2010 to 2019

Natalie Black is the Principal Environmental Planner for Black EARTH Environmental. Working a a range of projects, Bush Fire Assessments, Landscaping, Development Applications, Statements of Environmental Effect's, Environmental Management Plans, Sustainability Assessment of both private and businesses, sustainable gardens, environmental assessments for proposed projects and environmental advice and volunteering for local Sustainable Community Group and Landcare. During this time Natalie also lectured at Hunter TAFE teaching a range of environmental units both face to face and on-line to a varying range of qualification and levels.

2003 to 2010
Natalie was the Natural Resource Manager and Development Assessment Officer at Lismore City Council working with diverse range of professions such as engineers, town planners, environmental health officer, accountants, building surveyors, arborists, councillors. During this time the main projects were grants application, restoration projects, flora and fauna assessments, environmental legal adviser, bush fire assessments, strategic work, development application assessment (ranging from sheds to Designated Developments) and council development application team for internal projects, Council's for climate change, water wise programs and others. During 2006 -2007 Natalie was the lead Environmental Officer and Development Planner for the development of Council Plans of Management (POM). The POMs were for each parcel of land owned and managed lands, by Council. The parcels of land ranged from easements, parks and recreation areas to urban bushland, each POM provided clear guidelines and procedures for all works including civil, maintence and regeneration etc.

2002 to 2003 was a step into the Policy unit within DPI where Natalie was part of the team working on the Jervis Bay Indigenous Fishing Strategy, and the closure of Port Botany. Dealing with many stakeholders and running workshops with Ministers and community. During 2003 with Natalie was the North Coast Fish Passage Officer. Managing an Environmental Trust Grant of $1 million to remove 50 structures that block fish passage within the catchments of the North Coast. This project had all 50 sites contracted by the end of the 12 months with 70% of these projects commenced. This role allowed for the development of field assessments, independent work and communication with a range of stakeholders.

2000 saw the commencement of Natalie's career with NSW Department of Primary Industries (Fisheries Unit) in the Office of Conservation in Sydney. Natalie was part of the Conservation team that reviewed integrated development applications in the Sydney Region, with a focus on the seagrasses present within the estuaries. The assessments ranged from jetties to the Lane Cove Tunnel, North West T-Way and the expansion of the M7 and fish ladders.

BSc Honours Project was research paper into the variations of *Zostera capricorni* wrack located within the Tuggerah Lakes system in comparison to Brisbane Waters and Lake Macquarie.

Tim Mouton
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 (select summary)

- 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 Special 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

Professional Affiliations / Memberships (past / present)

- Board of Management member for Worimi Conservation Lands (NPWS & Worimi LALC)
- Certified Practitioner in Erosion & Sediment Control (CPESC) (not currently active)

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 - Current Burwood 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).