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Biodiversity Development Assessment Report

Proposed Residential Subdivision at Berry Park NSW

Prepared for: Avid Property Group

June 2023

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Project Number	1633.08
Client Name	Avid Property Group
Accredited Assessor	Natalie Black (BAAS: 19076)
AEP Project Team	Ian Benson Natalie Black Dennis Neader Kelly Drysdale Bonni Yare Lucy Knutson Angela Metcalfe Alissa Rogers Brendon Young Thomas Stephens Stephen Curry Samuel Rayfield Naomi Stackhouse

Revision

Revision	Date	Authors	Reviewed	Approved
00	18/02/2023	Thomas Stephens	Natalie Black	Natalie Black
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Distribution

Revision	Date	Name	Organisation
00	18/02/2023	Ben Jia	AVID Property Group
01	10/03/2023	Ben Jia	AVID Property Group
02	25/05/2023	Ben Jia	AVID Property Group
03	06/06/2023	Ben Jia	AVID Property Group

EXECUTIVE SUMMARY

Anderson Environment & Planning (AEP) was commissioned by AVID Property Group (the proponent) to undertake a Biodiversity Development Assessment Report (BDAR) over multiple lots within Berry Park, NSW, located within the Maitland Local Government Area (LGA) in the Lower Hunter region of New South Wales.

AVID Property Group is proposing a residential lot subdivision with associated civil works. The residential development will be primarily situated over Lot 112 DP734271, 24 Duckenfield Road, Berry Park; however, will also include multiple residue lots created as part of the adjoining subdivisions to the east and south, also proposed by the proponent. This area is currently zoned as General Residential (R1) and Primary Production (RU1). The proposal will comprise of two hundred and eighty-two (282) lots, in addition to internal roads, detention basins, drainage easements, and future access roads. The proposed activities include bulk earthworks, subdivision of land into saleable lots and key connector roads.

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

The Subject Site covers approximately 30.12ha, comprising 5.95ha of degraded native vegetation, with the remainder consisting of exotic vegetation and cleared/ managed lands. The Subject Site has been extensively grazed and undergone pasture improvement in the past, it is currently grazed by horse and cattle reducing the inherent biodiversity of the site. The land is actively managed by activities such as spraying of selective herbicide to remove weed species problematic for primary production grazing.

Where remnant vegetation occurs, one (1) Plant Community Type (PCT) was identified:

- PCT 1600 – *Spotted Gum – Narrow-leaved Ironbark – Grey Box shrub-grass open forest of the lower Hunter* (approximately 5.95ha). Which is commensurate with the BC listed TEC; Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions.

Condition thresholds have not been set within the final determination of the BC listed threatened ecological community (TEC), Lower Hunter *Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*. However, despite occurring in a highly degraded state, PCT 1600 found to be present on site is likely commensurate with this TEC.

The remainder of the Subject Site comprises of 24.17ha of exotic vegetation, cleared grassland, non-vegetated areas including access tracks, a dam and existing agricultural infrastructure.

Fauna species recorded were predominantly highly mobile species typical of those expected in this locality within remnant habitat with marginal connectivity to the adjoining landscape. Based on previous records within the locality and suitable habitat present, Southern Myotis (*Myotis macropus*) was assumed to be present within the Subject Site. Evidence of previous White-bellied Sea Eagle nesting behaviour was evident within the Site, however this breeding pair have since been observed nesting approx. 400m west of the Subject Site on the floodplain flats.

Avoid and minimise principles were considered throughout the planning stage of the proposed development. The location of the land on the outskirts of the growing township of Berry Park has been zoned for residential and previously heavily modified therefore, the proposed Subject Site is considered suitable. The proposed residential lots will be situated above the floodplains located within the Study Area. Low lying areas were considered unsuitable for residential lots with a subsect proposed to be managed under a Biodiversity Management Plan to improve biodiversity values.

Approximately 5.95ha of native and 24.17ha of exotic vegetation within the Subject Site will be cleared for the development. Given the surrounding area has been largely cleared for development, the residual

habitat values within the site do not offer long term survival or connectivity within the surrounding landscape for many fauna species.

Furthermore, landscaping and construction will contribute to the minimisation of impacts through:

- Environmentally-friendly lighting design that avoids light-spill into surrounding areas of native vegetation;
- Landscaping using trees endemic in the area; and
- Fencing where relevant, to reduce the likelihood of edge effects and prevent fauna incursions in active residential land.

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

- 89 ecosystem credits - PCT 1600 - *Spotted Gum – Narrow-leaved Ironbark – Grey Box shrub-grass open forest of the lower Hunter*
- 58 species credits – Southern Myotis (*Myotis macropus*)

Assessment of the proposal under other relevant environmental policy instruments including *State Environmental Planning Policy* (Koala Habitat Protection) 2021 (SEPP Koala), *State Environmental Planning Policy (Coastal Management) 2018 (*SEPP Coastal) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was undertaken. The development only provides potential seasonal foraging habitat for relevant species. Therefore, referral under the EPBC Act is not likely to be necessary for this development.

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Study Certification and Licensing

This report was written by Thomas Stephens, reviewed by Bonni Yare and certified by Natalie Black (BAAS: 19076) of Anderson Environment & Planning.

Staff	Title/Qualification	Tasks
Craig Anderson	Director BAppSc (EAM) BAAS: 18002	Scientific advice
Ian Benson	Co-Director & Principal Ecologist BEng (Civil) GradDipSc (Ecology) BAAS: 18147	Scientific advice, nocturnal surveys, diurnal surveys.
Natalie Black	Senior Environmental Manager / Works Coordinator BSc (Hons), Master Planning, Cert IV (TA) BAAS: 19076	Report review
Lucy Knutson	Senior Ecologist BEnvScMgt	BAM Plots
Kelly Drysdale	Ecologist Ass.Dip. App Sc, Grad Cert BA, TAE	HBT survey and nocturnal survey
Bonni Yare	Ecologist/Botanist BSc (NRM), Cert 3 Cons&LandMgt (partial completion)	BAM Plots, PCT determination, contributing author and flora transects
Alissa Rogers	Ecologist BPrkMgt	BAM plots
Angela Metcalfe	Ecologist BEnvScMgt (Hons)	Report review, GIS
Thomas Stephens	Ecologist BEnvScMgt	GIS, targeted fauna and flora surveys, diurnal bird surveys, contributing report author, monitoring equipment
Brendon Young	Ecologist M.Env.Mgt (Natural resources) B.Ap.Sc.(Fisheries) Grad Cert Fish Conservation and Land Mgmt	Camera trap deployment, diurnal bird survey and flora transects
Naomi Stackhouse	Ecologist BSc Eco/ Con & Biodiversity Mgmt. - under study	Flora transects
Stephen Curry	Ecologist BEnvScMgt Under study - Completion June 2023	Flora transects, targeted fauna surveys
Alana Guest	Ecologist BSc/BA (Biological/History) Hons EnvSc (Ecosystems and Biodiversity)	Flora transects
Callum Reedman	Ecologist / Botanist Dip Cons & Land Mmgt (2022)	Flora transects, vegetation assessment

Research was conducted under the following licences:

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

Certification:

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

- This report has been written to comply with the requirements of the BAM 2020 and obligations outlined within the BAM Assessor Code of Conduct and includes, in the opinion of the writer, a true and accurate account of the species recorded, or considered likely to occur within the Survey Area, and inferences of such for biodiversity credit calculations;
- Anderson Environment and Planning have no actual, potential or perceived conflicts of interest with AVID Property Group. Anderson Environment and Planning has received commercial payment for consulting services and assessment by AVID Property Group for this project.
- BAM Assessment methodology, as well as Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons;
- 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 / Works Coordinator

Anderson Environment & Planning

BAAS no. 19076

Calculator Ref: 00036606/BAAS19076/22/00036607

6 June 2023

Glossary of Terms

Assessment Area	Land occurring within a 1500m buffer around the Study Area boundary.
BAM	Biodiversity Assessment Method Order (2020) that determines: • Methodology applicable to quantifying biodiversity values inherent within a development site; • Avoid and minimise efforts required to be employed as part of any development proposal; and • Number and class of credits required to offset residual impacts of the proposal upon the biodiversity values therein.
BC Act	Biodiversity Conservation Act 2016
Biodiversity Credit Report	Specifies the number and type of biodiversity credits required to offset the impacts of a development.
BAM Calculator (BAM-C)	The online tool used to interpret site survey data and regional location information to quantify ecosystem and species credits required / generated at a development / stewardship site.
Biodiversity credits	Ecosystem or Species Credits required to offset the loss of biodiversity values on a development site.
Biodiversity offsets	Specific measures that are put in place to compensate for impacts on biodiversity values.
Biodiversity values	The composition, structure and function of ecosystems, and threatened species, populations and ecological communities, and their habitats.
BRW	Biodiversity Risk Weighting
CEEC	Critically Endangered Ecological Community
Council	Maitland City Council
DAWE	The former Commonwealth Department of Agricultural, Water and Environment
DCCEEW	The Commonwealth Department of Climate Change, Energy, the Environment and Water
DoEE	The former Commonwealth Department of the Environment and Energy
DPI	The NSW Department of Primary Industries
DPE	The NSW Department of Planning and Environment
DPIE	The former NSW Department of Planning, Industry and Environment
Ecosystem credit	The class of biodiversity credits created or required for the impact on EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur within a vegetation type.
EEC	Endangered Ecological Community
CEEC	Critically Endangered Ecological Community
EPBC Act	The Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
IBRA	Interim Biogeographic Regionalisation for Australia
OEH	The former NSW Office of Environment and Heritage
PFC	Percentage Foliage Cover
Subject Site	Land upon which the development is proposed, and within which residual impacts upon biodiversity are required to be offset, as shown in **Figure 1**
Species credit	Class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area based on habitat surrogates.

Study Area	Land located at 24 Duckenfield Road, Berry Park. The Study Area is shown on **Figure 1**.
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
VIS	Vegetation Integrity Score

1.0 Stage 1 – Biodiversity Assessment

1.1 Introduction

A residential subdivision and associated civil works are proposed over multiple lots within Berry Park, NSW. At the request of AVID Property Group (the Proponent), Anderson Environment & Planning (AEP) have undertaken the necessary investigations to inform the production of a Biodiversity Development Assessment Report (BDAR) addressing the proposed development.

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

1.1.1 Biodiversity Offset Scheme Threshold Trigger

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

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

Therefore, a BDAR is required, an assessment under Appendix C, Table 12 within Biodiversity Assessment Method Order 2020 (BAM Order).

1.1.2 Assessment Scope

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

This report includes:

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

1.1.3 The Proposal

AVID Property Group is proposing a residential lot subdivision and associated civil works. The residential development will be primarily situated over Lot 112 DP734271, 24 Duckenfield Road, Berry Park; and also include multiple residual lots created as part of the adjoining subdivisions to the east and south, also proposed by the proponent. This area is currently zoned as General Residential (R1) and Primary Production (RU1). The proposal will comprise of two hundred and eighty-two (282) lots, in addition to internal roads, detention basins, drainage easements, and future access roads. The proposed activities include bulk earthworks, subdivision of land into saleable lots and key connector roads.

The proposal will require the removal or modification of approx. 5.95ha of native vegetation.

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

1.1.4 General Description of the Subject Site

The Subject Site is located on the western outskirts of the township of Maitland Local Government Area (LGA) in the Hunter region. The Study Area is bound by Settlers Boulevard to the east, Rockmaster Street to the South, residential houses to the north east and a floodplain to the west. Land surrounding the Subject Site is currently zoned as General Residential (R1) except to the west which comprises of Primary Production (RU1).

The site is predominately cleared exotic grasslands with isolated patches of canopy trees and sparse shrubs. The Subject Site currently has horses and cattle grazing throughout the open paddock.

1.1.5 Site Particulars

Table 1 – Site Particulars

Detail	Comments
Client	AVID Property Group
Address	24 Duckenfield Road, Berry Park, NSW
Title(s)	Lot 112 DP 734271, Lot 6131 DP 1268036, Lot 6121 DP 1268036, Lot 3001 DP 1264314, Lot 2726 DP 1237666, Lot 2531 DP 1224018, Lot 2425 DP 1224017, Lot 4 DP 1222785, Lot 6140 DP1284398.
Study Area	Consists of the entirety of 24 Duckenfield Road, Berry Park
Subject Site	The Subject Site is an open paddock, including areas of native vegetation (5.95ha) and areas of cleared or exotic vegetation totalling approx. 24.17ha.
LGA	Maitland City Council
Zoning	Under the Maitland Local Environmental Plan 2011 (pub. 16-12-2011), the Subject Site is RU1 – Primary Production to the west and R1 – General Residential the eastern periphery.
Current Land Use	The land is currently used for farming practices with open paddock being grazed by cattle and horses.
Surrounding Land Use	To the north, south and east of the site the land is zoned R1 – General Residential comprised of a residential subdivision and open paddocks. To the west is a mixture of RU1 – Primary Production and C2 – Environmental Conservation where lies Four Mile Creek and an adjoining floodplain.

Figure 1 depicts the extent of the Subject Site and Study Area. **Figure 2** depicts the Study Area landscape features within the wider locality.

1.1.6 Geology and Soils

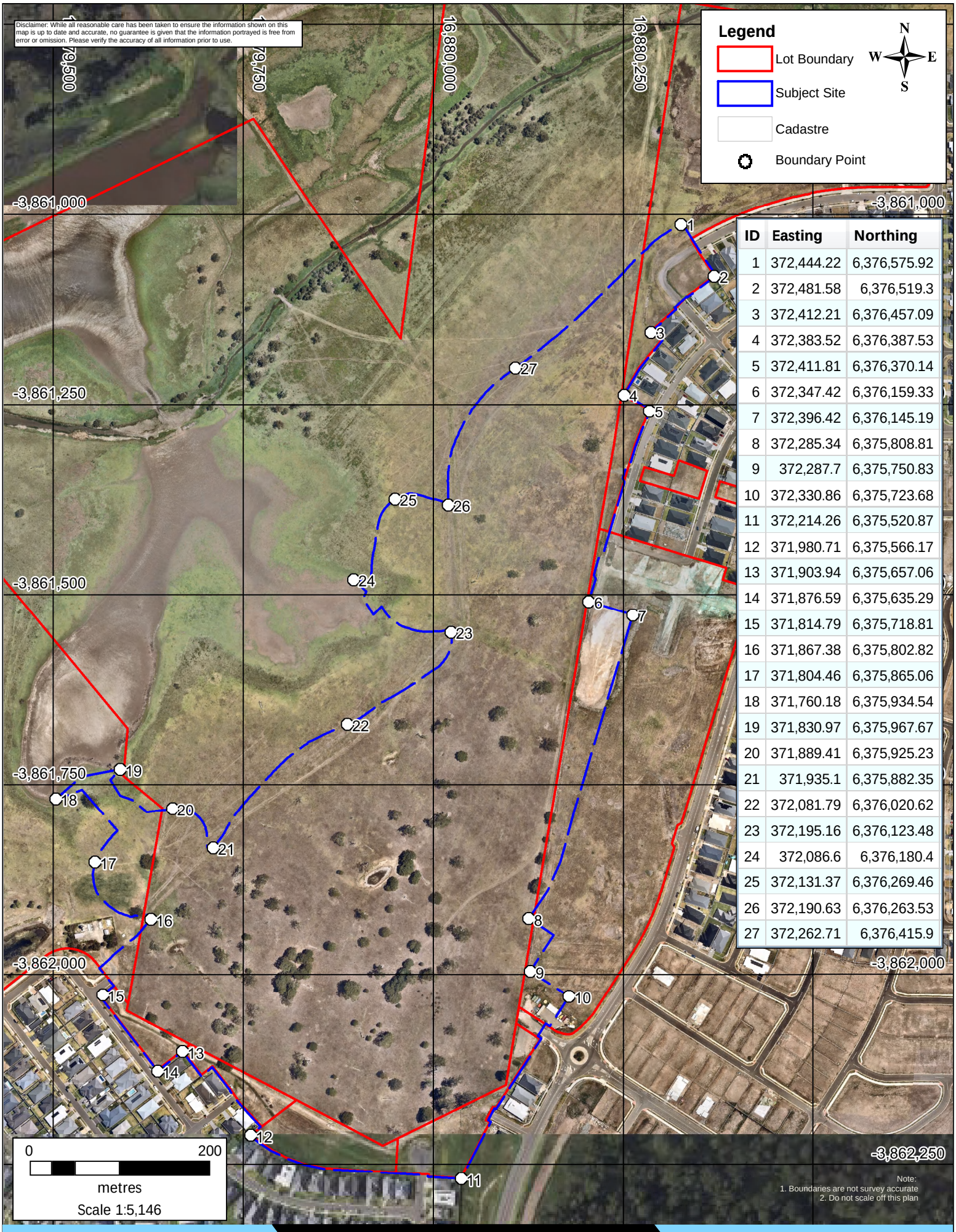
The Beresfield Soil Landscape underlies the site (1:100,000 Sheet Soil Landscapes). The Beresfield Soil Landscape is generally gently undulating low hills and rises on Permian sediments. With a relief of 10-50m, an elevation of 20-50m, and gentle slopes (3 – 15%). Soils include friable brownish black loam and hard setting dull yellowish brown sandy loam.

1.1.7 Information Sources

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

- Field surveys conducted within the site and surrounding areas by AEP (2022 & 2023);
- State survey guidelines (DEC 2004; DECC 2009; OEH 2018, DPIE 2020c; DPE 2022).

- PlantNET NSW (https://plantnet.rbgsyd.nsw.gov.au/);
- Aerial Photograph Interpretation (API) of the site and surrounding locality (Google 2022) and Nearmaps (2023);
- DPE Threatened Biodiversity Profiles (https://www.environment.nsw.gov.au/threatenedSpeciesApp/);
- Search and review of flora and fauna sighting records in the DPE BioNet Atlas within 10km of the site (https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-BioNet);
- Protected Matters Search within a 5km radius of the site held by DAWE, summarising Matters of National Environmental Significance that may occur in, or may relate to the Subject Site;
- DPE *BAM – Important Areas Map* to determine whether the site is mapped as *Swift Parrot, Regent Honeyeater, Migratory Shorebird* and *Plains-wanderer Important Areas;*
- Collective knowledge gained from previous ecological survey and assessment in the Maitland Regional Council area over the past 25 years; and
- Anecdotal records.



ID	Easting	Northing
1	372,444.22	6,376,575.92
2	372,481.58	6,376,519.3
3	372,412.21	6,376,457.09
4	372,383.52	6,376,387.53
5	372,411.81	6,376,370.14
6	372,347.42	6,376,159.33
7	372,396.42	6,376,145.19
8	372,285.34	6,375,808.81
9	372,287.7	6,375,750.83
10	372,330.86	6,375,723.68
11	372,214.26	6,375,520.87
12	371,980.71	6,375,566.17
13	371,903.94	6,375,657.06
14	371,876.59	6,375,635.29
15	371,814.79	6,375,718.81
16	371,867.38	6,375,802.82
17	371,804.46	6,375,865.06
18	371,760.18	6,375,934.54
19	371,830.97	6,375,967.67
20	371,889.41	6,375,925.23
21	371,935.1	6,375,882.35
22	372,081.79	6,376,020.62
23	372,195.16	6,376,123.48
24	372,086.6	6,376,180.4
25	372,131.37	6,376,269.46
26	372,190.63	6,376,263.53
27	372,262.71	6,376,415.9

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Figure 1 - Site Map

Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAMS: 36607

Client: Avid Property Group

AEP Ref: 1633.08

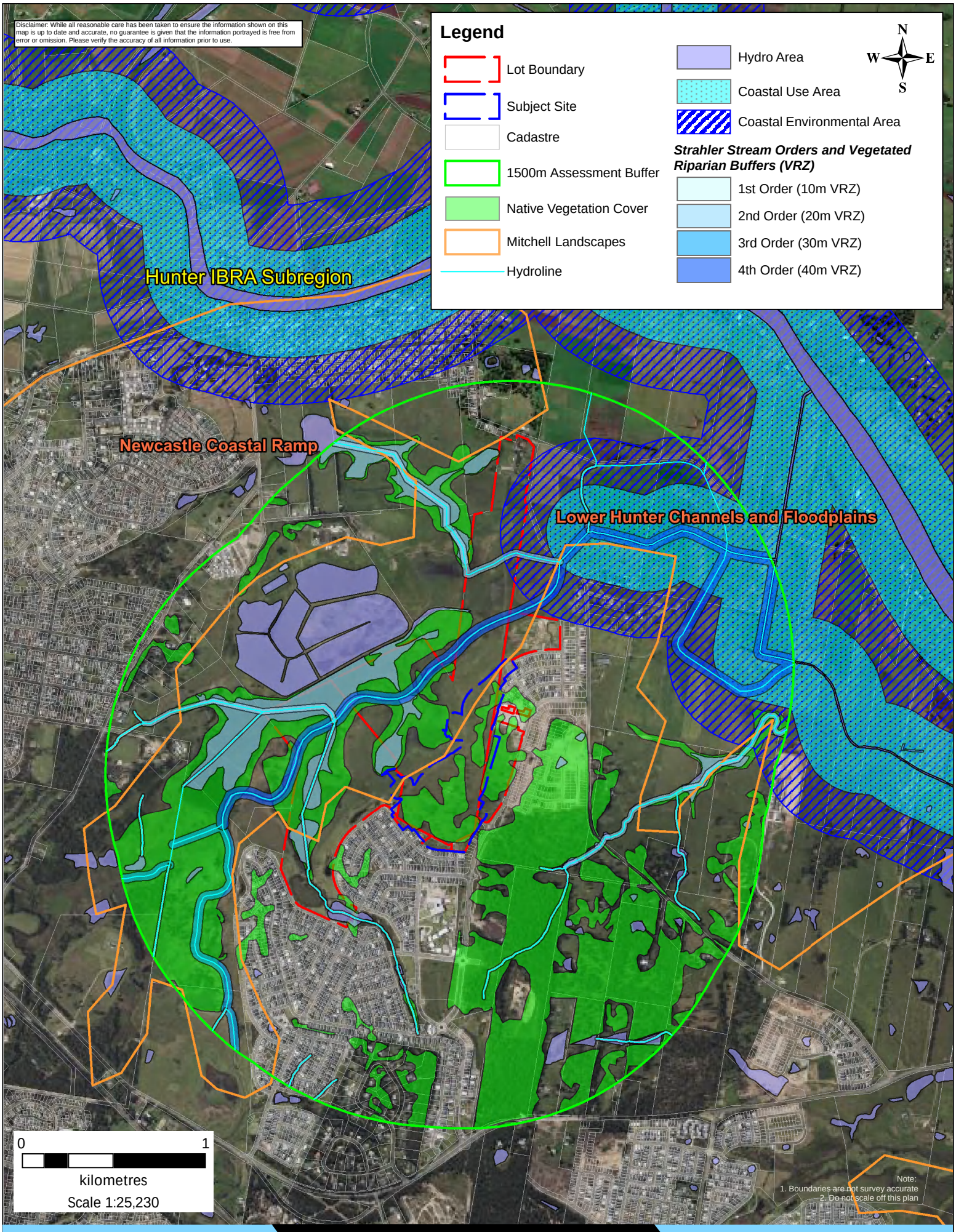

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Figure 2 - Site Location

Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAMS: 36607

Client: Avid Property Group

AEP Ref: 1633.08

1.2 Landscape Features

1.2.1 Regional Landscapes

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

- IBRA Bioregion: Sydney Basin.
- IBRA Subregion: Hunter.
- NSW Landscape: The Subject Site occurs predominately on the 'Newcastle Coastal Ramp' landscape with a smaller portion of the Subject Site occurring on the 'Lower Hunter Channels and Floodplains' landscape. The Newcastle Coastal Ramp Landscape was selected for use within the BAM calculator. Delineation of NSW Landscape areas is shown in **Figure 2**.

1.2.2 Identified Landscape Features

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

Table 2 – Landscape Feature Assessment

Landscape Feature	Assessment
Rivers and Streams	One (1) farm dam was recorded within the Subject Site. No hydrolines are mapped within the site. A fourth-order stream, Four Mile Creek, is located approximately 240m west from the site with mapped hydroareas mapped beyond the stream. Hunter River flows north to east on average 2.2kms north of the site.
Wetlands	No mapped wetlands (SEPP Resilience and Hazards 2021 or otherwise) occur within the site. One (1) artificial dam were recorded within the Subject Site.
Native Vegetation Extent	Approximately 5.95ha of native vegetation occurs in the Subject Site. All vegetation within the Subject Site is proposed to be cleared. PCTs occurring within the Subject Site are as follows: • PCT 1600 - *Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter* (5.95ha) PCT 1600 present on site is in a degraded to highly degraded state, however, it is likely commensurate with the *BC Act* listed TEC; *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and BSW North Coast Bioregions*
Connectivity Features	The Subject Site lies within the urban outskirts of a recent residential development in the suburb of Chisolm. Berry Park and surrounding suburbs is a growing hub of the Lower Hunter/ Maitland area. Vegetation that occurs on site has now been fragmented with the existing corridor to the east by Settlers Boulevard. The fragmentation and lack of vegetation in the locality is indicated by the low native vegetation extent of 14.49% shown in **Figure 2**. The most significant vegetation corridor is located east of the site.
Karst, Caves, Crevices, Cliffs, Rock and other Geological Features of Significance	There are no identified karst, caves, crevices, cliffs, rock and other geological features of significance within the Subject Site.
NSW Landscape	The Subject Site occurs within Newcastle Coastal Ramp and Lower Hunter Channels and Floodplains
Soil hazard features	None known on site.

Landscape Feature	Assessment
Features identified by the Secretary's Environmental Assessment Requirements (SEARs)	No SEARs apply to this proposal.
Areas of Outstanding Biodiversity Value (AOBV) under the BC Act:	No areas of AOBV are present on the Subject Site. AOBV mapped land is located approximately 250m to the north.

1.3 Site Context Components

1.3.1 Method

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

1.3.2 Landscape Native Vegetation Cover

The Assessment Area, consisting of a 1500m buffer placed around the Subject Site, covers approximately 1158ha. Approximately 167.84ha comprises native vegetation as per Section 4.3.2 of the BAM. This equates to approximately 14.49% native vegetation cover and was entered as such within the BAM Calculator.

1.4 Native Vegetation

1.4.1 Regional Mapping

Regional vegetation mapping utilised for the site was State Vegetation Type Mapping (DPE, 2022). The vegetation communities mapped within the area, and their extent, are provided in **Table 3** and **Figure 3.**

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

Table 3 - Regional Vegetation Mapping Results

PCT ID	PCT Name	Area
1600	Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	12.5
N/A	Disturbed - Rehabilitation	17.62
	Total	**30.12**

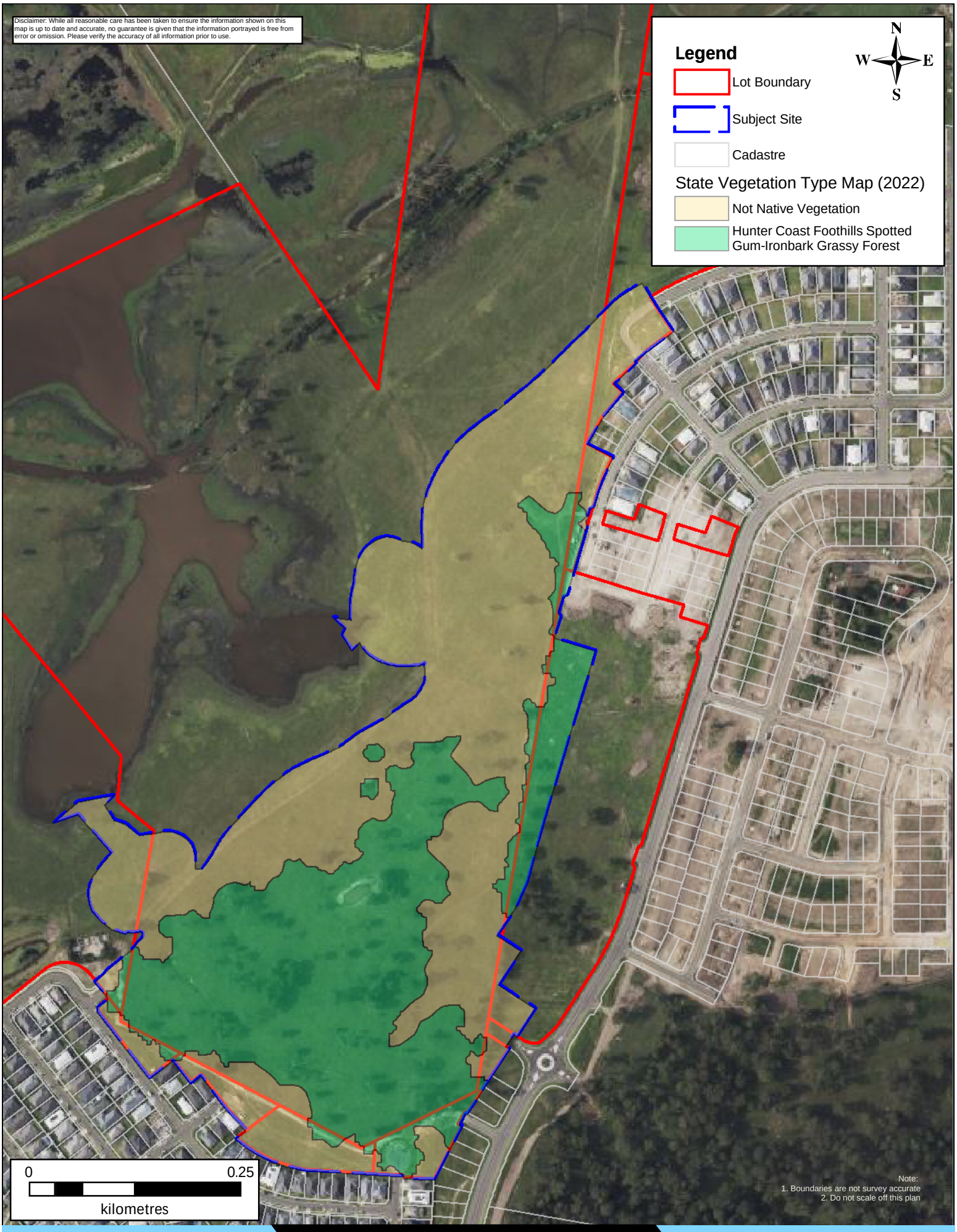

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Figure 3 - Regional Vegetation | Date: June 2023

Location: 24 Duckenfield Road, Berry Park | BOAM Ref: 36607

Client: Avid Property Group | AEP Ref: 1633.08

1.4.2 Plot Based Floristics Surveys

Flora surveys were undertaken by AEP in September 2022 and May 2023 to produce a flora species list for the Subject Site, to search specifically for threatened flora and fauna species known to occur within the wider area, and to gather data necessary to both derive vegetation community type(s) and to meet relevant survey guidelines. Such works included:

- Ground-truthing of vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices;
- Systematic coverage of the site using the Random Meander Technique (Cropper 1993);
- A total of five (5) BAM plots were undertaken by AEP. Four (4) within the remnant native vegetation and one (1) within exotic vegetation present within the Subject Site. Plots were located randomly within each vegetation zone. Minor modifications to plot locations were made on site due to factors such as ecotones and proximity to disturbed edges.
- Field sheets and data are provided in **Appendix D**. The location of BAM Plots is depicted in **Figure 4**.

1.4.2.1 Plant Community Types (PCTs) and Vegetation Zones

The Subject Site contains one large fenced off paddock in various conditions, including exotic grassland predominately to the north, and remnant canopy trees occurring throughout the site. Canopy trees in the south form a patch. Native canopy regeneration is suppressed due to active grazing by cattle and horses across much of the site, although regeneration is still present in some areas.

Man-made drainage and a farm dam are located at the centre of the site. Multiple dispersed piles of dead branches and small rocks occur along the eastern sections of the site and form the edge of the floodplain.

The soil has been compressed by cattle and contains high nutrients in areas of informal tracks, surrounding the dam and paddock trees. These areas are highly disturbed, containing exotic weeds, with less than 2% cover of locally endemic species based on one (1) BAM plot carried out in the disturbed area in the north of the site.

Where degraded native grassland and canopy occurs, one (1) Plant Community Type (PCT) was identified, represented by scattered *Corymbia maculata* and *Eucalyptus fibrosa* with a sparse shrub layer and remnant groundcovers:

- PCT 1600 – *Spotted Gum – Narrow-leaved Ironbark – Grey Box shrub-grass open forest of the lower Hunter* (approximately 5.95ha). This PCT is commensurate with the BC listed TEC *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*.

The remainder of the project area consists of cleared/weeds and/or non-native pasture. Areas that were cleared or dominated with weeds and/or non-native pasture were grouped and validated as not being assigned to a PCT. Many of these areas lacked structural diversity and were dominated by one (1) or two (2) weed species, most notably, *Lolium perenne* (Perennial Ryegrass) and White Clover (*Trifolium repens*).

Several high threat weeds are present including *Senecio madagascariensis* (Fireweed), *Trifolium repens* (White Clover), *Cenchrus clandestinum* (Kikuyu), *Romulea rosea, Plantago lanceolata* (Ribwort) and *Paspalum dilatatum* (Paspalum).

Fieldwork identified two (2) native vegetation zones within the Subject Site, described in **Section 1.4.3**. Ground-truthed PCT's and vegetation zones across the Subject Site are shown in **Figure 4**. BAM plot photographs are included in the body of the report and additional site photographs are provided in **Appendix F**.

1.4.3 PCT Selection Justification

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

Diagnostic species recorded on site during fieldwork that support the determination of PCTs are shown in **Tables 3** and **4** below.

Table 4 – Species Data for Potential PCT Determination

Plot ID	Dominant Native Species	Diagnostic species present	Potential PCTs
1	*Nil - exotic*	*N/A*	N/A
2	*Lobelia purpurascens, Oxalis perennans, Corymbia maculata, Eucalyptus fibrosa, Lomandra filliformis, Bursaria spinosa, Entolasia stricta, Commelina cyanea*	*Lobelia purpurascens, Corymbia maculata, Eucalyptus fibrosa, Lomandra filliformis, Bursaria spinosa, Entolasia stricta*	1590, 1593, 1600, 1601
3	*Lobelia purpurascens, Corymbia maculata, Eucalyptus fibrosa, Lomandra filliformis, Bursaria spinosa, Entolasia stricta, Centella asiatica, Lachnagrostis filliformis*	*Lobelia purpurascens, Corymbia maculata, Eucalyptus fibrosa, Lomandra filliformis, Bursaria spinosa, Entolasia stricta*	1590, 1593, 1600, 1601
4	*Corymbia maculata, Oxalis perennans, Pseudognaphalium luteoalbum*	*Corymbia maculata, Oxalis perennans*	1590, 1593, 1600, 1601
5	*Corymbia maculata, Echinopogon caespitosus, Eragrostis brownii, Dichelachne micrantha, Lachnagrostis filiformis, Rytidosperma fulvum, Entolasia stricta, Microlaena stipoides, Lomandra multiflora, Epaltes australis, Bursaria spinosa, Centella asiatica, Velleia paradoxa, Paspalidium distans, Persicaria lapathifolia, Lobelia purpurascens, Lythrum hyssopifolia*	*Corymbia maculata, Entolasia stricta, Microlaena stipoides, Lomandra multiflora, Bursaria spinosa, Lobelia purpurascens,*	1590, 1593, 1600, 1601

Review of floristic data concluded that plots and PCTs were associated as follows. Further justification is provided in **Tables 5** and **13**.

Table 5 – Determination of PCT 1600

Potential PCTs	1590	1593	1600	1601
Regional Vegetation	No	No	Yes – mapped within the site	No
IBRA Region	Sydney Basin	Sydney Basin	Sydney Basin	Sydney Basin
IBRA Subregion	Hunter	Hunter	Hunter	Hunter
NSW Landscape	Newcastle Coastal Ramp	Newcastle Coastal Ramp	Newcastle Coastal Ramp	Newcastle Coastal Ramp
LGA	Maitland	Maitland	Maitland	Maitland
Listed Key Diagnostic Species (VIS)	**Canopy Species:** *Corymbia maculata; Eucalyptus umbra; Eucalyptus fibrosa.* **Mid Stratum:** *Allocasuarina torulosa; Pultenaea villosa; Persoonia linearis; Breynia oblongifolia; Bursaria spinosa; Leucopogon juniperinus; Daviesia ulicifolia; Pandorea pandorana;* **Ground Stratum:** *Microlaena stipoides; Themeda australis; Imperata cylindrica; Cymbopogon refractus; Aristida vagans; Pratia purpurascens; Vernonia cinerea; Dianella caerulea; Lomandra multiflora; Lepidosperma laterale; Cheilanthes sieberi;*	**Canopy Species:** *Eucalyptus fibrosa; Corymbia maculata;* **Mid Stratum**: *Melaleuca nodosa; Bursaria spinosa; Melaleuca decora; Pultenaea spinosa; Acacia parvipinnula; Correa reflexa; Maytenus silvestris; Macrozamia flexuosa; Ozothamnus diosmifolius; Persoonia linearis; Myrsine variabilis;* **Ground Stratum:** *Aristida vagans; Entolasia stricta; Microlaena stipoides; Lepidosperma laterale; Dianella revoluta; Pomax umbellata; Goodenia rotundifolia; Cheilanthes sieberi;*	**Canopy Species:** *Corymbia maculata; Eucalyptus fibrosa; Eucalyptus crebra; Eucalyptus moluccana;* **Mid Stratum:** *Bursaria spinosa; Daviesia ulicifolia; Acacia parvipinnula; Breynia oblongifolia; Leucopogon juniperinus;* **Ground Stratum:** *Aristida vagans; Themeda australis; Lomandra confertifolia; Lomandra filiformis; Vernonia cinerea; Brunoniella australis; Pratia purpurascens; Cheilanthes sieberi;*	**Canopy Species:** *Corymbia maculata; Eucalyptus crebra; Eucalyptus fibrosa;* **Mid Stratum:** *Daviesia ulicifolia; Lissanthe strigosa; Bursaria spinosa; Acacia parvipinnula;* **Ground Stratum:** *Cymbopogon refractus; Aristida vagans; Aristida ramosa; Microlaena stipoides; Cheilanthes sieberi; Lomandra multiflora; Dianella revoluta; Pratia purpurascens; Brunoniella australis; Laxmannia gracilis;*
Present Key Diagnostic Species within Study Area	**Canopy Species:** *Corymbia maculata; Eucalyptus fibrosa.* **Mid Stratum:** *Bursaria spinosa;* **Ground Stratum:** *Microlaena stipoides; Aristida vagans; Pratia purpurascens; Lomandra multiflora;*	**Canopy Species:** *Eucalyptus fibrosa; Corymbia maculata;* **Mid Stratum**: *Bursaria spinosa;* **Ground Stratum:** *Aristida vagans; Entolasia stricta; Microlaena stipoides;*	**Canopy Species:** *Corymbia maculata; Eucalyptus fibrosa;* **Mid Stratum:** *Bursaria spinosa;* **Ground Stratum:** *Aristida vagans; Lomandra filiformis; Pratia purpurascens;*	**Canopy Species:** *Corymbia maculata; Eucalyptus fibrosa;* **Mid Stratum:** *Bursaria spinosa;* **Ground Stratum:** *Aristida vagans; Microlaena stipoides; Lomandra multiflora; Pratia purpurascens;*

Potential PCTs	1590	1593	1600	1601
Absence of Key Diagnostic Species within the Study Area	**Canopy Species:** *Eucalyptus umbra;* **Mid Stratum:** *Allocasuarina torulosa; Pultenaea villosa; Persoonia linearis; Breynia oblongifolia; Leucopogon juniperinus; Daviesia ulicifolia; Pandorea pandorana.* **Ground Stratum:** *Themeda australis; Imperata cylindrica; Cymbopogon refractus; Vernonia cinerea; Dianella caerulea; Lepidosperma laterale; Cheilanthes sieberi;*	**Canopy Species:** **Mid Stratum**: *Melaleuca nodosa; Melaleuca decora; Pultenaea spinosa; Acacia parvipinnula; Correa reflexa; Maytenus silvestris; Macrozamia flexuosa; Ozothamnus diosmifolius; Persoonia linearis; Myrsine variabilis.* **Ground Stratum:** *Lepidosperma laterale; Dianella revoluta; Pomax umbellata; Goodenia rotundifolia; Cheilanthes sieberi;*	**Canopy Species:** *Eucalyptus crebra; Eucalyptus moluccana;* **Mid Stratum:** *Daviesia ulicifolia; Acacia parvipinnula; Breynia oblongifolia; Leucopogon juniperinus;* **Ground Stratum:** *Themeda australis; Lomandra confertifolia; Vernonia cinerea; Brunoniella australis; Cheilanthes sieberi;*	**Canopy Species:** *Eucalyptus crebra;* **Mid Stratum:** *Daviesia ulicifolia; Lissanthe strigosa; Acacia parvipinnula;* **Ground Stratum:** *Cymbopogon refractus; Aristida ramosa; Cheilanthes sieberi; Lomandra multiflora; Dianella revoluta; Brunoniella australis; Laxmannia gracilis;*
PCT Description	Open forests with a canopy dominated by *Corymbia maculata*. The mid-storey consists of a diverse open shrub layer along with various small climbers. The ground layer is characteristically grassy with a mix of forbs; small ferns and other graminoids. Low ranges of the lower Hunter Valley and Central Coast at lower elevations.	Open forests with a canopy dominated by *Eucalyptus fibrosa*. The mid-storey consists of a diverse open shrub layer. The ground layer is typically dominated by grasses with forbs and small ferns. Restricted to the lower Hunter Valley.	Open forests with a canopy dominated by *Corymbia maculata*. The mid-storey consists of an open shrub layer. The ground layer is predominately grassy with various graminoids; forbs and small ferns. Restricted to the lower Hunter Valley.	Open forests with a canopy dominated by *Corymbia maculata* and *Eucalyptus crebra*. The mid-storey consists of a sparse shrub layer. The ground layer is predominately grassy with various graminoids; forbs and small ferns. Central and Lower Hunter Valley.
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);	Dry Sclerophyll Forests (Shrub/grass sub-formation);
Vegetation Class	Hunter-Macleay Dry Sclerophyll Forests;	Hunter-Macleay Dry Sclerophyll Forests;	Hunter-Macleay Dry Sclerophyll Forests;	Hunter-Macleay Dry Sclerophyll Forests;
Geographical Restrictions	flats; low rises (hillslopes); Low ranges of the lower Hunter Valley and Central Coast at lower elevations	flats; low rises; Restricted to the lower Hunter Valley.	hillslopes; low rises; Restricted to the lower Hunter Valley.	flats; Central and Lower Hunter Valley.
Elevation	Information not available	Information not available	Information not available	Information not available

Potential PCTs	1590	1593	1600	1601
Soil Profiles	Sandstone, Conglomerate	Information not available	Siltstone, Conglomerate	Conglomerate, Sandstone
Habitat Restrictions	PCT 1590 occurs on low ranges of the lower Hunter Valley and Central Coast at lower elevations (Hunter Project). site data confirm its presence in Hunter, Karuah Manning, Upper Hunter, and Wyong SRs. It may also extend into Pittwater SR.	PCT 1593 is restricted to the lower Hunter Valley (Hunter Project). Site/map data confine this PCT to Hunter and Wyong SRs, but it is likely to extend into Karuah Manning SR, and may be represented in lower parts of Upper Hunter and Yengo SRs.	PCT 1600 is restricted to the lower Hunter Valley, and occurs in Hunter, Karuah Manning, Upper Hunter, Wyong, and Yengo SRs (Hunter Project).	PCT 1601 occurs in central and lower Hunter Valley (Hunter Project). Site data associated this PCT with Hunter SR while map data extends it into Karuah Manning, Upper Hunter, Wyong, and Yengo SRs. It may also extend into Ellerston, Kerrabee, Mummel Escarpment, and Tomalla SRs.
PCT Determination	The community on site is in a degraded condition with minimal floristic information to inform the PCT. Based on the regional mapping and floristic information, PCT 1600 was considered a better fit for the site.	The community on site is in a degraded condition with minimal floristic information to inform the PCT. Based on the regional mapping and floristic information, PCT 1600 was considered a better fit for the site.	The vegetation community is regionally mapped as occurring within the site. Due to the degraded nature of the site, it is difficult to determine a PCT from a limited number of diagnostic species and floristic overlap between similar communities, given the regional vegetation and floristic fit, this PCT was considered best fit for the site.	The community on site is in a degraded condition with minimal floristic information to inform the PCT. Based on the regional mapping and floristic information, PCT 1600 was considered a better fit for the site.
Result	**PCT 1600**			
BAM Plots	**2, 3, 4 & 5**			
Estimate cleared value of PCT (%)	71			
EEC	Listed BC Act, E: Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions (Equivalent) largely equivalent to; Listed BC Act, E: Central Hunter Ironbark" Spotted Gum" Grey Box Forest in the New South Wales North Coast and Sydney Basin Bioregions (Part). This PCT is considered to be commensurate with the state listed TEC. The EPBC CEC has been further assessed further refer **Appendix G.**			
Vegetation Zones				
Vegetation Zones of PCT	• Degraded			

Potential PCTs	1590	1593	1600	1601
1600 within Subject Site				

Table 6 – PCT 1600 – Degraded

Category	Description
Description of Vegetation Zone	This vegetation zone occurs in the southern section of the site and is defined by canopy trees, containing a number of native species, including a sparse shrub layer and grassy understorey. These areas are moderately disturbed, natural regeneration is present and residual species persist within the mid and ground stratum. Large trees are common throughout the site with numerous hollows. **Canopy Stratum:** The canopy is dominated by *Corymbia maculata* which co-occurs with a number of other eucalypt species including *Eucalyptus fibrosa,* and an unidentified ironbark. **Mid-Stratum:** The midstory is generally sparse with occasional individuals of *Bursaria spinosa* and *Callistemon linearis.* **Ground-Stratum:** The ground stratum possesses a mix of native and exotic species, containing native grasses; *Entolasia stricta* and *Lachnagrostis filliformis.* Common forbs include *Oxalis perennans, Lobelia purpurascens,* and an unidentified sedge. **Common weeds:** Exotic species are prominent throughout this zone and included exotic grasses and other common pasture weeds such as *Sida rhombifolia*, *Lolium perrenne* (Perennial Ryegrass), *Poa annua*, *Hypochaeris radicata* (Catsear), and *Trifolium repens* (White Clover) High threat exotic species include *Cenchrus clandestinum* (Kikuyu), and *Senecio madagascariensis* (Fireweed).
Area of Vegetation Zone (ha)	This vegetation zone covers approx. 5.95ha of the Subject Site.
Plot	2, 3, 4 and 5

PCT 1600 Degraded BAM Plot 2

Category	Description
 PCT 1600 Severely Degraded BAM Plot 3	 PCT 1600 Degraded BAM Plot 4	 PCT 1600 Degraded BAM Plot 5

1.4.4 Non-native / Cleared / Existing Infrastructure

A large portion of the Subject Site (24.71ha) has been identified as exotic vegetation on cleared pasture improved land. Vegetation has been highly degraded by horses and cattle. The dominant exotic species that occur throughout this area include pasture forbs and grasses; *Lolium perrenne* (Perrennial Ryegrass), *Plantago lanceolata* (Lambs tongue), *Briza minor*, *Hypochaeris radicata* (Catsear), *Trifolium repens* (White Clover) and cosmopolitan species *Cynodon dactylon*. These areas were not included in the PCT determination as they contain primarily exotic species and no native plant community could be associated (VIS score of <5).

High threat exotic species include *Cenchrus clandestinum* (Kikuyu), and *Senecio madagascariensis* (Fireweed).

Table 7 – Non-native / Cleared - BAM Plots

Non-native / Cleared - BAM Plot Photographs

BAM Plot 1 - Exotic Pasture

1.4.5 Summary of Vegetation Zones Areas

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

Table 8 provides a summary of the vegetation within the Site.

Table 8 – Summary of Vegetation Zones Areas

Zone	Vegetation Community	Condition	Total Subject Site / Area of Removal (ha)
1	PCT 1600	Degraded	5.95
Total Native Vegetation (ha)			**5.95**
Non-remnant / cleared areas / rural / exotic			24.17
Total (ha)			**30.12**

Discrepancies in numbers are due to rounding.

AEP

Figure 4 - Ground-truthed Vegetation

Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAM Ref: 36607

Client: Avid Property Group

AEP Ref: 1633.08

1.4.6 Vegetation Integrity Assessment

1.4.5.1 Patch Size

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

1.4.7 Vegetation Integrity Score

Plot data was used to determine the composition, structure and function condition score of the vegetation zones within the Subject Site, which informed the vegetation integrity score. Plot data has been tabulated (refer **Tables 17 - 19**) and includes corresponding condition scores along with the overall vegetation integrity score. Vegetation Condition Class has been rated using the following percentage bands associated with the Vegetation Integrity Scores:

- 70 - 100 Good;
- 50 - 69 Moderate;
- 35 - 49 Poor;
- 25 - 34 Degraded;
- 16 - 24 Highly Degraded; and
- <15 Severely Degraded.

Table 9 – VIS for PCT 1600 - Highly Degraded

Site Attribute	**PCT 1600- Degraded**			
Plot #	3	4	5	2
Location	372046E 6375641N	372153E 6375902N	372135E 6375679N	372012E 6375723N
Bearing	70	70	270	80
Tree	2	1	1	2
Shrub	0	0	1	1
Grass & Grass-like	4	1	10	4
Forb	4	2	5	4
Fern	0	0	0	0
Other	0	0	0	0
Composition Condition Score	**20.4**			
Tree	30	20	25	60
Shrub	0	0	0.3	0.1
Grass & Grass-like	0.6	0.2	17.1	1.6
Forb	1.5	0.2	0.9	0.7
Fern	0	0	0	0
Other	0	0	0	0
Structure Condition Score	**25.8**			
Regenerating Stems (<5cm DBH)	Present	Absent	Present	Present
Stem Classes (cm DBH)	10-19, 20-29, 50-79	80>	10-19, 20-29	20-29, 30-49, 50-79
# Large Trees	2	1	1	4
Hollow-bearing Trees	1	1	1	0
Litter Cover (%)	4	3	33	25
Coarse Woody Debris (m)	5	2	44	8
High Threat Weed Cover	1.2	0.5	5	1.1
Function Condition Score	**50.8**			
Current Vegetation Integrity Score	**29.9**			

1.5 Threatened Species

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

A predicted Ecosystem Credit Species assessment is presented in **Table 11**, and a Species Credit Species assessment is presented in **Table 12**.

Field surveys were undertaken on site in August, September and November 2022 and, January, February and May 2023. A summary of survey effort within the Subject Site is included in **Section 1.4** and **Table 20**. Flora and fauna species lists are presented in **Appendix B** and **Appendix C.**

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

1.5.1 Ecosystem Credit Species

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

The 'biodiversity risk weighting' (BRW) for a species is based on the 'sensitivity to loss' and 'sensitivity to potential gain' score using criteria listed in Appendix I of the BAM, and are used in credit calculations to assess impacts of the proposal on a threatened species. The sensitivity to gain class is listed within the BAM calculator for Ecosystem Credit Species.

Ecosystem Credit Species predicted to occur within the site are provided in **Table 11**.

Table 10 – Predicted Ecosystem Credit Species

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (BioNet Atlas 2023) Y/N	Recorded by AEP within site nearby surrounds Y/N
Anthochaera phrygia	Regent Honeyeater (Foraging)	High	Y	N
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	Moderate	Y	N
Calyptorhynchus lathami	Glossy Black-Cockatoo	High	Y	N
Chthonicola sagittata	Speckled Warbler	High	N	N
Climacteris picumnus victoriae	Brown Treecreeper (Eastern subspecies)	High	Y	N
Dasyurus maculatus	Spotted-tailed Quoll	High	N	N
Glossopsitta pusilla	Little Lorikeet	High	Y	N
Grantiella picta	Painted Honeyeater	Moderate	N	N
Haliaeetus leucogaster	**White-bellied Sea-Eagle**	**High**	**Y**	**Y**
Hieraaetus morphnoides	Little Eagle	Moderate	Y	N
Hirundapus caudacutus	White-throated Needletail	High	Y	N
Lathamus discolor	Swift Parrot (Foraging)	Moderate	Y	N
Lophoictinia isura	Square-tailed Kite (Foraging)	Moderate	Y	N
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	Moderate	N	N
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Moderate	Y	N
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	High	Y	N
Miniopterus australis	Little Bent-winged Bat (Foraging)	High	Y	N
Miniopterus orianae oceanensis	Large Bent-winged Bat	High	Y	N
Neophema pulchella	Turquoise Parrot	High	N	N
Ninox connivens	Barking Owl (Foraging)	High	Y	N
Ninox strenua	Powerful Owl (Foraging)	High	Y	N
Petroica bodang	Scarlet Robin	Moderate	Y	N
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Moderate	Y	N

Scientific Name	Common Name	Sensitivity to Gain Class	Recorded within 10km (BioNet Atlas 2023) Y/N	Recorded by AEP within site nearby surrounds Y/N
Pteropus poliocephalus	Grey-headed Flying fox	High	Y	N
Saccolaimus flaviventris	Yellow-belied Sheathtail-bat	High	Y	N
Stagonopleura guttata	Diamond Firetail	Moderate	N	N
Tyto novaehollandiae	Masked Owl (Foraging)	High	Y	N

1.5.2 Species Credit Species

Additional threatened fauna species determined by the BAM calculator that have the potential to use the Subject Site as suitable habitat are identified in **Table 12**.

Table 11 – Potential Species Credit Species

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements / Habitats Searched / General Notes
Flora					
Callistemon linearifolius Netted Bottle Brush	1.5	N	1	One record located approximately 5.1km south of the Subject Site	Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer.
Diuris tricolor Pine Donkey Orchid	1.5	N	0	N/A	Disturbance regimes are not known, although the species is usually recorded from disturbed habitats. Associated species include *Callitris glaucophylla, Eucalyptus populnea, Eucalyptus intertexta*, Ironbark and Acacia shrubland. The understorey is often grassy with herbaceous plants such as Bulbine species. Usually, flowers between early September to late October. The species is a tuberous, deciduous terrestrial orchid and the flowers have a pleasant, light sweet scent. The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (Callitris spp.). It is found in sandy soils, either on flats or small rises. Also recorded from a red earth soil in a Bimble Box community in western NSW.
Eucalyptus castrensis Singleton Mallee	3	Y	0	N/A	Very restricted in range, but locally dominant from a single stand in Singleton occurring as a dense mallee stand over about three hectares, on a low broad ridgetop on loam over sandstone. Occurs on a low broad ridgetop on loam over sandstone. The understorey consists of grasses and scattered shrubs, with bare ground and litter. *Eucalyptus fibrosa and Corymbia maculata* grow adjacent to, but not within, the stand.
Cynanchum elegans White-flowered Wax Plant	2	N	0	N/A	Usually occurs on the edge of dry rainforest vegetation. Restricted to eastern NSW where it is distributed from Brunswick Heads on the north coast to Gerroa in the Illawarra region. The species has been recorded as far west as Merriwa in the upper Hunter River valley. A climber or twiner with a highly variable form. Mature stems have a fissured corky bark and can grow to 10 metres long and 3.5 cm thick
Rutidosis heterogama Heath Wrinklewort	2	N	0	N/A	Grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements / Habitats Searched / General Notes
Pterostylis chaetophora	2	N	0	N/A	In NSW it is currently known from 18 scattered locations in a relatively small area between Taree and Kurri Kurri, extending to the south-east towards Tea Gardens and west into the Upper Hunter, with additional records near Denman and Wingen. The preferred habitat is seasonally moist, dry sclerophyll forest with a grass and shrub understorey. Most commonly observed habitat is vegetation characterised by grassy open forests or derived native grasslands of *Eucalyptus amplifolia* and *Eucalyptus moluccana* on gentle flats, or that are dominated by *Corymbia maculata* with any of *Eucalyptus fibrosa, Eucalyptus sideroploia* or *Eucalyptus crebra*.
Eucalyptus glaucina Slaty Red Gum	2	N	0	N/A	Found in separate districts along the eastern seaboard of NSW, from near Casino, to Taree, south to Broke, and recently discovered on the eastern side of the Blue Mountains National Park near Warragamba Dam. Grows in grassy woodland and dry eucalypt forest, on deep, moderately fertile and well-watered soils.
Eucalyptus parramattensis subsp. decandens	2	N	0	N/A	Generally, occupies deep, low-nutrient sands, often those subject to periodic inundation or where water tables are relatively high. It occurs in dry sclerophyll woodland with dry heath understorey. It also occurs as an emergent in dry or wet heathland. Often where this species occurs, it is a community dominant.
Eucalyptus pumila	3	Y	0	N/A	The single known population occupies north-west-facing slopes derived from sandstone. Present as a mid-canopy species to a height of 6 m within dry sclerophyll woodland which has a canopy comprising *Eucalyptus fibrosa, Callitris endlicheri* and, to a lesser extent, *Corymbia maculata*. It is thought to flower in April-May, but like many eucalypts does not flower every year.
Fauna					
Burhinus grallarius Bush Stone-curlew	2	N	0	N/A	Species is mainly found in western slopes and plains and the Riverina, smaller numbers on Central and North Coast with increasing numbers in Tweed Valley. It may be easier to detect during breeding season, possibly calls all year, but it is unclear how well it responds to playback. The species was allocated to a species credit as experts determined that it cannot be predicted to occur at a site based on vegetation surrogates but can be detected reliably from survey.
Callocephalon fimbriatum Gang-gang Cockatoo	2	N	0	N/A	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. Favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 7 cm in diameter or larger in eucalypts and 3 metres or more above the ground.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements / Habitats Searched / General Notes
Calyptorhynchus lathami Glossy Black-Cockatoo	2	N	0	N/A	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Inland populations feed on a wide range of sheoaks, including Drooping Sheoak, *Allocasuaraina diminuta*, and *A. gymnathera*. Belah is also utilised and may be a critical food source for some populations.
Delma impar Striped Legless Lizard	1.5	N	0	N/A	Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses. Sometimes present in modified grasslands with a significant content of exotic grasses and surface rocks, which are used for shelter. Actively hunts for spiders, crickets, moth larvae and cockroaches. Two papery eggs are laid in early summer and they go below ground or under rocks or logs during winter.
Haliaeetus leucogaster White-bellied Sea-Eagle	2	N	170	One BioNet sighting recorded within the Subject Site in June 2022. Record indicates a pair of White-bellied Sea-Eagles are occupying a nest. AEP surveys and an expert report have confirmed that this nest is no longer being utilised (refer to **Appendix G** and **Figure 8**). The next closest sighting of the species is approx. 1.1km west of the Subject Site.	Terrestrial habitat includes coastal dunes, tidal flats, grassland, heathland, woodland and forest. Requires large emergent eucalypts for nesting. Living or dead mature trees within suitable vegetation within 1km of a rivers, lakes, large dams or creeks, wetlands and coastlines.
Hieraaetus morphnoides Little Eagle	1.5	N	6	Multiple records run parallel to the adjacent floodplain west of the site. The closest sighting was recorded approx. 1.3km from the Subject Site.	Little Eagle is a dual credit species. Foraging habitat is considered an ecosystem credit and breeding is considered a species credit. The species nest in live (occasionally dead) large old trees within vegetation. Paddock trees can provide important breeding habitat (there are examples of nest trees in ACT). Breeding habitat is live (occasionally dead) large old trees within suitable vegetation and 1. the presence of a male and female; or 2. female with nesting material; or 3. an individual on a large stick nest in the top half of the tree canopy.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements / Habitats Searched / General Notes
Litoria aurea Green and Golden Bell Frog	2	N	1	One sighting was recorded along the floodplain approx. 1.9km from the Subject Site.	Habitat for the species includes semi-permanent/ephemeral wet areas, within 1km of swamps, waterbodies or wet areas. In high altitude populations calling seasons are restricted to summer months. While chytrid is a potential threat to some populations of the species, other populations are subject to manageable threats.
Litoria brevipalmata Green-thighed Frog	1.5	N	0	N/A	The species was allocated to species credit species because presence cannot be predicted from vegetation or landscape surrogates. Experts noted that it is difficult to detect from survey, detection could be optimised by detailed/strict survey guidelines. Survey: reliant on rainfall events for calling/breeding when it is usually detected/surveyed, strongly suggest >75\mm in 24 hrs or 150mm over 72 hrs as the most probable time to survey and detect the species. Note that tadpoles are susceptible to injury during netting, and can be identified from observation.
Lophoictinia isura Square-tailed Kite	1.5	N	17	Multiple records extend from the south-west to the south-east of the site. The closest sighting is recorded approx. 2.9km from the Subject Site. The location of these sightings is within areas of high residential development.	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Appears to occupy large hunting ranges of more than 100 square km. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs.
Myotis macropus Southern Myotis	2	N	14	Fourteen sightings are recorded to the south-west of the Subject Site. The closest sighting to the Subject Site is approx. 1.1km.	Generally, roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. In NSW females have one young each year usually in November or December.
Ninox connivens Barking Owl	2	N	1	One sighting was recorded approx. 1.1km north-west from the Subject Site	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Roosts in shaded portions of tree canopies. Requires large old trees with hollows for nesting. Barking Owl are a dual credit species.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements / Habitats Searched / General Notes
Ninox strenua Powerful Owl	2	N	6	One sighting was recorded approx. 2.9km south of the Subject Site.	The species inhabits a range of vegetation types from woodland and open sclerophyll forest to tall open wet forest and rainforest. Requires large tree hollows (≥0.5m deep) in large eucalypts (DBH 80-240cm) that are at least 150 years old.
Petaurus norfolcensis Squirrel Glider	2	N	25	Records of this species spread from the south-west to the south-east. The closest sighting is recorded approx. 980m from the Subject Site.	Inhabits Blackbutt-Bloodwood Forest with heath understorey in coastal areas. Lives in family groups. Requires abundant tree hollows for refuge and nesting. Survey year round but sites with bi-pinnate acacia, autumn winter flowering trees and shrubs such as *Eucalyptus robusta* and Banksia sp. (integrifolia etc.) should be subject to a more retracted survey period of between March-August. Relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely-connected (i.e., no more than 50 m apart). Important known food plants – *Eucalyptus siderophloia/tereticornis/pilularis/robusta, Corymbia gummifera, Melaleuca quinquenervia, Acacia longifolia, Banksia spp.*
Phascogale tapoatafa Brush-tailed Phascogale	2	N	5	Five sightings have been recorded within close proximity of one another. These sightings are located approx. 2.2km north-west of the Subject Site.	Prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater. Feeds mostly on arthropods but will also eat other invertebrates, nectar and sometimes small vertebrates. Females have exclusive territories of approximately 20 - 40 ha, while males have overlapping territories often greater than 100 ha. Nest and shelter in tree hollows with entrances 2.5 - 4 cm wide and use many different hollows over a short time span. Mating occurs May - July; males die soon after the mating season whereas females can live for up to three years but generally only produce one litter.
Phascolarctos cinereus Koala	2	N	3	Three BioNet records have been recorded within the vicinity of the site. Two have been recorded to the north-west approx. 2.9km from the Subject Site. The third approx. 5.9km south-east.	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size.

Species	Risk Weighting (BRW)	SAII (Y/N)	BioNet Records (10km)	Details of BioNet Record	Habitat Requirements / Habitats Searched / General Notes
Tyto novaehollandiae Masked Owl	2	N	5	Five BioNet records have all been located south of the Subject Site. The closest sighting was recorded approx. 1.9km from the Subject site.	Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW, excluding the most arid north-western corner. There is no seasonal variation in its distribution. Lives in dry eucalypt forests and woodlands from sea level to 1100 m.

The following Potential Credit Species have been excluded from the species credits species list in accordance with *Section 5.2.2.2 (a, b or c) of BAM 2020* (refer to **Table 12)** for the Subject Site.

Table 12 – Potential Credit Species Excluded and Removed from BAM - C

Scientific Name	Common Name	Habitat Constraints (Y / N)	Habitat Degraded (Y / N)	Geographic Limitations (Y / N)	Species is Vagrant (Y / N)	Assessment
Acacia bynoeana	Bynoe's Wattle	N	Y	N	N	The mid-storey is mostly absent from the site, with only marginal species present. The site is considered too degraded for this species.
Anthochaera Phrygia	Regent Honeyeater (Breeding)	Y	N	N	N	The Subject Site does not contain areas of the species Important Habitat Map.
Aprasia parapulchella	Pink-tailed Legless Lizard	Y	N	N	N	Rocky areas are not located in or 50m from the Subject Site.
Cercartetus nanus	Eastern Pygmy Possum	N	Y	N	N	Habitat is highly degraded. No species records in locality and Subject Site is not connected to suitable habitat
Chalinolobus dwyeri	Large-eared Pied Bat	Y	N	N	N	The site is not within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels.
Diuris praecox	Rough Doubletail	N	Y	Y	N	The Subject Site is not located within the Newcastle LGA and the site is degraded with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Diuiris tricolor	Pine Donkey Orchid	N	Y	N	N	The site is degraded with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	N	Y	N	N	The site is degraded with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Hoplocephalus bitorquatus	Pale-headed Snake	N	Y	N	N	There are no nearby records of this species within the area and the site is not connected to areas of suitable habitat.
Lathamus discolor	Swift Parrot (Breeding)	Y	N	N	N	The Subject Site is not mapped as Important Habitat for this species.

Scientific Name	Common Name	Habitat Constraints (Y / N)	Habitat Degraded (Y / N)	Geographic Limitations (Y / N)	Species is Vagrant (Y / N)	Assessment
Miniopterus australis	Little Bent-winged Bat (Breeding)	Y	N	N	N	No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'.
Miniopterus oriane oceanensis	Large Bent-winged Bat (Breeding)	Y	N	N	N	No cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave'.
Monotaxis macrophylla	Large-leafed Monotaxis	N	Y	N	N	The site is degraded with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Ozothamnus tesselatus		N	Y	N	N	The site is degraded with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Persoonia pauciflora	North Rothbury Persoonia	N	N	Y	N	The Subject Site is not within 10 km of North Rothbury.
Petrogale penicillate	Brush-tailed Rock-wallaby	Y	N	N	N	No suitable habitat – the site is not within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.
Planigale maculata	Common Planigale	N	Y	N	N	No BioNet sightings have been recorded within a 10km radius of the Subject Site. The site contains degraded habitat with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Pomaderris queenslandica	Scant Pomaderris	N	Y	N	N	The site is degraded with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Prostanthera cineolifera	Singleton Mint Bush	N	Y	N	N	The site is degraded with a low species richness for groundcovers and shrubs, this species is unlikely to occur on site.
Pteropus poliocephalus	Grey-headed Flying-fox	Y	N	N	N	No known breeding camps located within the Subject Site and no breeding camps were identified on site during surveys.

Scientific Name	Common Name	Habitat Constraints (Y / N)	Habitat Degraded (Y / N)	Geographic Limitations (Y / N)	Species is Vagrant (Y / N)	Assessment
Vespadelus troughtoni	Eastern Cave Bat	Y	N	N	N	There are no identified rocky areas containing caves, overhangs, escarpments, outcrops, crevices or boulder piles, or within two kilometres of old mines, tunnels, old buildings or sheds.

1.5.3 Field Survey Methods

Surveys are deemed to fulfill minimum survey requirement. Part of the Subject Site, to the east, north and south has undergone recent earthworks as part of the surrounding approved developments, these areas have not been surveyed. Details of the flora and fauna survey are presented in **Table 13** and were conducted using relevant guidelines, in particular DPE survey guidelines for threatened plants (2020) and amphibians (2020), along with applicable EPBC guidelines (2010; 2011). Flora and fauna survey effort are shown in **Figures 6**.

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

1.5.3.1 Habitat Features Surveys

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

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

1.5.3.2 Flora Field Survey

All required flora survey techniques were utilised for targeted survey of the species listed in **Table 12** above and guided by DPIE Threatened Flora Survey Guidelines (2020) and the BAM (2020).

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

- Ground-truthing of vegetation mapping to identify all vegetation communities present onsite as well as segregate vegetation zones according to condition and current management practices.
- Seasonal threatened flora surveys utilising the two-phase grid-based systematic approach, targeting a range of threatened flora.
- Identification of all vascular plant species encountered during fieldwork. Subject Site coverage was both systematic to ensure all key points of the site were checked, and therein the Random Meander Technique (Cropper 1993) was utilised to maximise species encountered.
- Five (5) BAM plots were undertaken in accordance with BAM 2020.
- Updated/Refined Vegetation Community Mapping involving traversal over the entire Study Area, concentrating particularly on mapping the boundaries between the identified Biometric Vegetation Types of the BAM 2020 and refining the original mapping which involved a larger number of vegetation units.

1.5.3.3 Fauna Field Surveys

All required fauna survey techniques were utilised for targeted survey of the species listed in **Table 13** and guided by the *Threatened Species Survey and Assessment Guidelines* (2004). Survey effort is shown in **Figure 6**.

Survey effort was conducted by AEP during the months of August, September, November 2022, January, February and May 2023 (**Table 13**).

1.5.3.4 Incidental Observations

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

1.6 Survey Effort

The survey methods above were utilised across the Study Area commencing in August 2022 to May 2023. **Table 13** outlines provides a summary of field surveys.

Table 13 – Field Survey Periods

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Staff	Rainfall (mm)
27/08/2022	6pm-8pm	2	Nocturnal Surveys – Call playback, stagwatch and spotlighting,	Koala, Barking Owl, Squirrel Glider, Owls (Powerful Owl, Masked Owl and Barking Owl), Barn owl, southern boobook) Eastern Pygmy Possum, Bush-stone Curlew, Pale-Headed Snake,	1	IB	0
28/08/2022	6pm-7pm	1	Nocturnal Surveys – Call playback, stagwatch and spotlighting,	Bush-stone Curlew, Glossy Black Cockatoo, Spotted Harrier, Black Falcon, White-Bellied Sea Eagle, Little Eagle, Square-tailed kite, Forest Owls (Powerful Owl, Masked Owl and Barking Owl), Barn owl, Southern Boobook	1	IB	0
07/09/2022	8:50am-9:50am	1	Diurnal Bird Survey	Bush-stone Curlew, Glossy Black Cockatoo, Spotted Harrier, Black Falcon, White-Bellied Sea Eagle, Little Eagle, Square-tailed kite	1	IB	0
14/09/2022	4:30pm-7:30pm	3	Diurnal Bird Survey	Bush-stone Curlew, Glossy Black Cockatoo, Spotted Harrier, Black Falcon, White-Bellied Sea Eagle, Little Eagle, Square-tailed kite, Forest Owls (Powerful Owl, Masked Owl and Barking Owl), Barn owl, Southern Boobook	1	DN	0
15/09/2022	9am-3:30pm	6.5	Incidental Surveys, 4 x BAM plots Vegetation mapping Hollow Bearing Tree Survey Flora transects	General Incidentals, *Callistemon linearifolius, Eucalyptus glaucina, Eucalyptus parramattensis subsp. decadens,* White-Bellied Sea Eagle	5	LK, AR, TS, SC and EB	0.6
27/09/2022	1pm-7:30pm	6.5	Hollow Bearing Tree Survey Nocturnal Surveys	General Incidentals, Gang-Gang Cockatoo	2	KD and LK	0
9/11/2022	3pm-10pm	7	Camera Trap Deployment Diurnal Bird Survey Active Anabat survey*	White-Bellied Sea Eagle, *Myotis Macropus*	2	BYO and TS	0
23/11/2022	12:30-21:30	9	Camera Trap Refresh Targeted flora transects Nocturnal survey	Targeted flora surveys for *Cryptostylis hunteriana, Pterostylis chaetophora, Thesium australe, Monotaxis macrophylla, Cynanchum elegans* and *Rutidosis heterogama*	1	BYO	0

Date	Time	Hours	Field activity	Targeted Species	No. of Persons on Site	Staff	Rainfall (mm)
			Active Anabat Surveys 2x Koala CPB	Nocturnal spotlighting and active anabat surveys targeting *Myotis Macropus* and koalas			
24/11/2022	9am-3:30pm	6.5	Reinstall cameras Koala Spot Assessment surveys Targeted flora transects	Targeted flora surveys for *Cryptostylis hunteriana, Pterostylis chaetophora, Thesium australe, Monotaxis macrophylla, Cynanchum elegans* and *Rutidosis heterogama*. Koala	2	BYO and NS	0
30/11/2022	12:30-2:30pm	2	Flora transects	Targeted flora surveys for *Cryptostylis hunteriana, Pterostylis chaetophora, Thesium australe, Monotaxis macrophylla, Cynanchum elegans* and *Rutidosis heterogama.*	2	BY & AG	0
24/01/2023	8:45-10:00am	1.25	1 x BAM plot	Incidental Survey	1	BY	0
22/02/2023	8:50-9:50pm	1	Frog surveys	Green-thighed Frog *(Litoria brevipalmata)* and Green and Golden Bell Frog *(Litoria aurea)*	2	BY & RN	25 (Maitland Belmore Bridge – Hunter River)
23/02/2023	8:55-10:05pm	1	Frog surveys	Green-thighed Frog *(Litoria brevipalmata)* and Green and Golden Bell Frog *(Litoria aurea)*	2	BY & RN	81 (Maitland Belmore Bridge – Hunter River)
12/5/2023	10:30am - 2:30pm	4	Site walkover of extended Subject Site Vegetation assessment of NVE	General incidentals	1	CR	0

*Refer to **Appendix I** for a full Bat Analysis Report

1.6.1 Survey Effort Results

1.6.1.1 Habitat Trees

A total of 84 habitat trees with a total of three hundred and seventy-four (374) hollows were identified within the Subject Site as listed in **Table 14.** Where hollow presence is assumed, it is due to the height and orientation of the hollow, which in some cases made definite identification not possible. Despite thorough surveying, very small hollows may also have gone unnoticed that would be suitable for small species such as microbats. Others may have gone unobserved due to the height and orientation of potential hollows. HBTs are mapped in **Figure 6**.

Table 14 - Habitat Tree Detail

GPS Point ID	Scientific Name	DBH	Hollows					Other Habitat Features
			XL	L	M	S	XS	
1	*Eucalyptus fibrosa*	86				1	2	
2	*Eucalyptus fibrosa*	95				2		
3	*Eucalyptus fibrosa*	75					1	Stick nest (medium) unoccupied
4	*Eucalyptus fibrosa*	86				1	2	
5	*Eucalyptus fibrosa*	78			1	2	4	Termite nest with opening 15cm wide. Tree is dying
6	*Eucalyptus fibrosa*	60				1	1	
7	Stag	65			1		1	
8	*Eucalyptus fibrosa*	56		1				Hollow facing up. Presumed to be hit by lightning
9	Stag	47			1	2		
10	*Corymbia maculata*	83		1	3			Medium hollow facing up with large crack facing south
11	*Corymbia maculata*	72		1	1			Large hollow facing up. Medium hollow mid-way up tree
12	*Corymbia maculata*	86		1	3	2		Rosellas in tree
13	*Corymbia maculata*	96		1	5	6	4	
14	Stag	95		1	4	5	3	Large currently unused WBSE nest located at top of canopy. See **Appendix H**
15	Ironbark spp.	68		1	1	5		
16	*Corymbia maculata*	105	1					
17	*Corymbia maculata*	110				1		
18	*Corymbia maculata*	87		4	2			
19	Ironbark spp.	75				1		
20	*Corymbia maculata*	100	1	1				XL goes from base to top
21	Ironbark spp.	65			2			

GPS Point ID	Scientific Name	DBH	Hollows					Other Habitat Features
			XL	L	M	S	XS	
22	Ironbark spp.	70				4		
23	Stag	70		1	2	5		
24	Stag	55		1	1	1		Nesting lorikeets
25	Stag	70		1		2		
26	Ironbark spp.	72			1	3		Deeply fissured bark
27	*Corymbia maculata*	120		1	3	5		Corellas and rainbow lorikeets present. Likley nesting.
28	Ironbark spp.	80				5		
29	*Corymbia maculata*	110		1	2	3		Corellas nesting
30	*Corymbia maculata*	90	2	1	1	7		
31	Ironbark spp.	65			1			
32	Stag	40				2		
33	Stag	65			1	2		
34	Ironbark spp.	75			2	3		
35	*Corymbia maculata*	95	1	1	1	2		
36	Stag	60	1		1	1		
37	Stag	70	1					
38	*Corymbia maculata*	1000	3	3				
39	*Corymbia maculata*	1200			1	2		
40	*Corymbia maculata*	900	2	1	2			
41	Stag	900	1					Very large split
42	*Corymbia maculata*	1200			1	2		
43	*Corymbia maculata*	800			3	5		
44	Ironbark spp.	900			1	3		
45	*Corymbia maculata*	1000	3	1				
46	Stag	600				1		
47	Ironbark spp.	650			1	1		
48	Stag	500	1		1			Eastern rosellas nesting
49	Stag	40				1		
50	Ironbark spp.	700				1		
51	*Corymbia maculata*	750	1	1	1			
52	Ironbark spp.	800				1		
53	Ironbark spp.	700				1		Fissured bark
54	Stag	500			1	5		
55	Ironbark spp.	600				2		
56	Stag	800	3		7	5		Nesting corella
57	*Corymbia maculata*	1100	2	2		4		Bees and stick nest
58	*Corymbia maculata*	900	1		2	2		Stick nest Nesting cockatoo
59	*Corymbia maculata*	950		4		2		
60	*Corymbia maculata*	1200	2		4	8		Nesting corella and rainbow lorikeet

GPS Point ID	Scientific Name	DBH	Hollows					Other Habitat Features
			XL	L	M	S	XS	
61	Stag	45				2		
62	Ironbark spp.	90				2		
63	Stag	85	1					
64	*Corymbia maculata*	90	1		2	2		
65	Stag	50	1			2		Nesting galah
66	Ironbark spp.	70			1	2		
67	Ironbark spp.	80	1		1	2		
68	Ironbark spp.	90		1	1	2		Nest with plastic
69	Stag	100	2		2	5		
70	Ironbark spp.	70	1			2		Nesting lorikeet
71	Stag	90	3					
72	Stag	70			4	8		Nesting lorikeet
73	*Corymbia maculata*	120	4	1		3		
74	*Corymbia maculata*	80	1					
75	*Corymbia maculata*	120	1	1	3	5		
76	*Corymbia maculata*	70			1	5		
77	Ironbark spp.	60				3		
78	*Corymbia maculata*	90	1		3	3		
79	Ironbark spp.	75	1	3		2		
80	*Corymbia maculata*	100			1			
81	*Corymbia maculata*	110			3			Stick nest
82	*Corymbia maculata*	90	1	3				
83	*Corymbia maculata*	100	2	2		2		Stick nest
84	*Corymbia maculata*	90		1	3	4		
Total Hollows by size			**47**	**43**	**90**	**176**	**18**	
Total Hollows			**374**					

1.6.1.2 Water Features and Hydrology

No underground sources of water or aquifers feed streams or wetlands occur on the Subject Site that would likely be affected by the Project. Above ground sources of water include one man-made dam. The dam lacks native aquatic vegetation and likely offers only marginal habitat value for resident fauna. Further assessment and consultation with Department of Planning Industry and Environment (Water) (DPIE -Water) is required to determine if *Section 91* of the *Water Management Act, 2000 (*WM Act*)* is triggered.

1.6.1.3 Other habitat features

The Subject Site possesses additional habitat features including piles of logs and fallen trees that may provide potential habitat. The Subject Site is located approximately 400m east of Four Mile Creek. Hunter River is also located 2.27kms north and east of the site.

No caves, karsts or rocky outcrops occurred on site and are considered a habitat constraint for cave dwelling microbats.

1.6.2 Species Credit Species Survey Results

Overall survey effort within the site (for plots, targeted searches and habitat assessments) and within the Subject Site (from past surveys, including plots, targeted searches, habitat assessments, song meters) is detailed in **Table 15** and was conducted using relevant guidelines, in particular DPIE survey guidelines for threatened plants (2020) and amphibians (2020), along with applicable EPBC Act guidelines (2010; 2011). Surveys conducted are detailed in **Table 14** and **Table 15,** survey effort coverage is displayed in **Figure 6**. **Table 15** presents the results of targeted surveys.

Table 15 – Species Credit Species

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date(s) Surveyed	Habitat (Present / Condition)	Comments	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Flora												
Callistemon linearifolius Netted Bottle Brush	Oct-Jan	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	N	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	15/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the establishment of a mid-stratum. Due to the highly degraded nature of the site with significant incidence of exotic species and lack of mid-stratum this species is considered highly unlikely to occur on site.	The species was surveyed in mid-September 2022, with no sightings confirmed on site. Additional targeted flora surveys were carried out within the flowering period of this species with three (3) visits in November 2022. It is believed due to the degraded and open natire of the site this species would have been sighted during these surveys if present. One sighting of the species has been found 5.1km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Cryptostylis hunteriana Leafless Tongue Orchid	Nov-Jan	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Y	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	23/11/2022 24/11/2022 30/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the species to flourish. Due to the highly degraded nature of the site with significant incidence of exotic species this species is considered highly unlikely to occur on site.	The species was surveyed in November 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Cynanchum elegans White-flowered Wax Plant	All year	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Y	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	23/11/2022 24/11/2022 30/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the species to flourish. Due to the highly degraded nature of the site with significant incidence of exotic species this species is considered highly unlikely to occur on site.	The species was surveyed in November 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Eucalyptus glaucina Slaty Red Gum	All year	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Y	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation.	15/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the establishment of any canopy plant. Due to the highly degraded nature of the site with significant incidence of exotic species and lack of diverse canopy trees this species is considered highly unlikely to occur on site.	The species was surveyed in September 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Eucalyptus parramattensis subsp. parramattensis	All year	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation. For each hectare of potential habitat average field traverse	Y	Parallel walking transects – Maximum distance between transects 20m in open, 10m in dense vegetation.	15/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the establishment of any canopy plant. Due to the highly degraded nature of the site with	The species was surveyed in September 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the	N/A	N	N	N	N

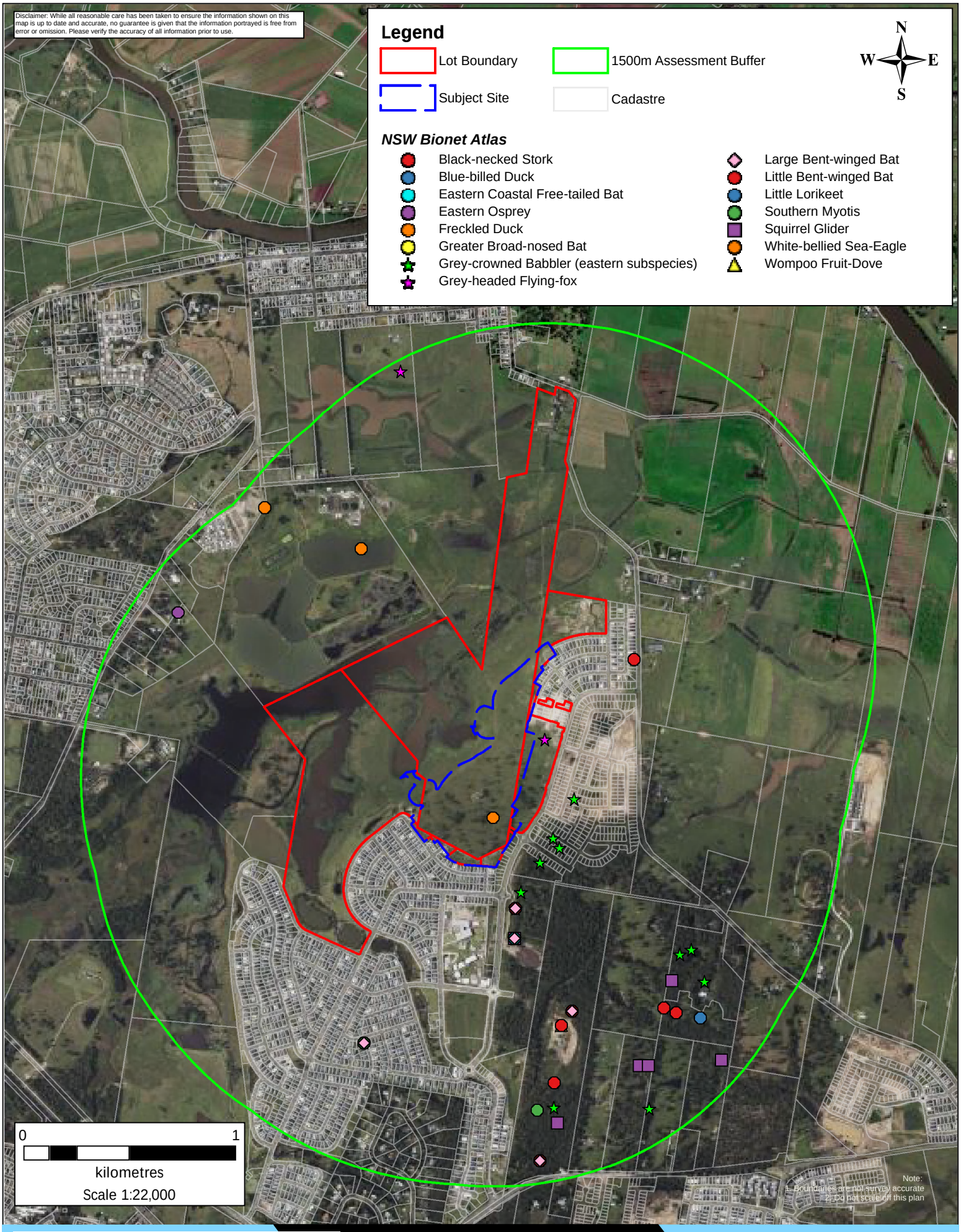
Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date(s) Surveyed	Habitat (Present / Condition)	Comments	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
		length 2km at 5m separation or 1km at 10m separation.				significant incidence of exotic species and lack of diverse canopy tree this species is considered highly unlikely to occur on site.	site, this species has been determined to not be present.					
Monotaxis macrophylla Large-leafed Monotaxis	Aug-Feb	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Y	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	23/11/20222 4/11/2022 30/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the species to flourish. Due to the highly degraded nature of the site with significant incidence of exotic species this species is considered highly unlikely to occur on site.	The species was surveyed in November 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Pterostylis chaetophora	Sept-Nov	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Y	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	23/11/2022 24/11/2022 30/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the species to flourish. Due to the highly degraded nature of the site with significant incidence of exotic species this species is considered highly unlikely to occur on site.	The species was surveyed in November 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Rutidosis heterogama Heath Wrinklewort	All year	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Y	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	23/11/2022 24/11/2022 30/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the species to flourish. Due to the highly degraded nature of the site with significant incidence of exotic species this species is considered highly unlikely to occur on site.	The species was surveyed in November 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Thesium austral Austral Toadflax	Nov-Feb	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation. For each hectare of potential habitat average field traverse length 2km at 5m separation or 1km at 10m separation.	Y	Parallel walking transects – Maximum distance between transects 10m in open, 5m in dense vegetation.	23/11/2022 24/11/2022 30/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the species to flourish. Due to the highly degraded nature of the site with significant incidence of exotic species this species is considered highly unlikely to occur on site.	The species was surveyed in November 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Fauna												
Burhinus grallarius Bush Stone-curlew	All year	Diurnal bird census – Flushing by walking through potential habitat. Spotlighting by foot or from a vehicle driven in first gear.	Y	Targeted and incidental bird surveys were undertaken in August, September and November	28/08/2022 07/09/2022 14/09/2022 09/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. Cattle and horses regularly use the site and the lack of midstory and sufficient habitat of fallen timber including logs.	The species was surveyed for in August, September and November 2022, with no sightings. No records of the species has been found within 10km. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date(s) Surveyed	Habitat (Present / Condition)	Comments	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Callocephalon fimbriatum Gang-gang Cockatoo	Oct-Jan	Area based survey methods	Y	Hollow Bearing Tree Survey and Nocturnal Surveys	27/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing any intact forest or woodland to establish. Due to the highly degraded nature of the site this species is considered highly unlikely to occur on site.	The species was surveyed in September 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Calyptorhynchus lathami Glossy Black-Cockatoo	April-Sept	This is a dual credit species. The identification of breeding habitat will require survey or an expert report. For clearing or development assessments, presence can be assumed. Assessors should look for signs of breeding on site as follows; (a) begging birds of any age or sex; or (b) lone adult males identified during the breeding season (April to August); or (c) an occupied nest.	Y	Targeted and incidental bird surveys	28/08/2022 07/09/2022 14/09/2022 09/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site does not have any woodlands or forest that contain She-oak. Due to the highly degraded nature of the site this species is considered highly unlikely to occur on site.	The species was surveyed in August, September and November 2022, with no sightings. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N/A	N	N	N	N
Delmar impar Striped Legless Lizard	Sep-Dec	Area Based survey methods	Y	N/A	15/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the species to flourish. Due to the highly degraded nature of the site this species is considered highly unlikely to occur on site.	The species was surveyed in September 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N	N	N	N	N
Haliaeetus leucogaster White-bellied Sea-Eagle	July-Dec	Area based survey methods. Habitat assessment – 30 minutes searching each relevant habitats such as large old trees within 1km of rivers, lakes, large dams or creeks, wetlands and coastlines. Searching for stick nests, prey and feathers.	Y	Incidental and targeted bird diurnal surveys	28/08/2022 07/09/2022 14/09/2022 15/09/2022 09/11/2022	Suitable habitat does occur within the Subject Site and there is evidence of historical nesting within the site, however due to the surrounding residential developments, the Subject Site is no longer suitable for this species.	This species was observed in flight within the Subject Site however, the nest tree of these individuals is located to the west of the Subject Site. See **Appendix H** for Sea-Eagle Final Report and **Figure 8** for species buffer.	N/A	Y	Y	Y	N
Hieraaetus morphnoides Little Eagle	Aug-Oct	Area based survey methods. Habitat assessment – 30 minutes searching each relevant habitats such live (occasionally dead) large old trees within suitable vegetation AND the presence of a male and female; or female with	Y	Incidental and targeted bird diurnal surveys	28/08/2022 07/09/2022 14/09/2022	The site comprises of large sparse canopy trees with only two areas where these trees are clumped. The site is fragmented from any large areas of intact vegetation.	The species was surveyed in August and September 2022, with no sightings confirmed on site. Six sighting of the species has been found within 10km from the site with one record located 1.3km to the north. Due to the lack of local records and the degraded nature of the site, this	N/A	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date(s) Surveyed	Habitat (Present / Condition)	Comments	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
		nesting material; or an individual on a large stick nest in the top half of the tree canopy.					species has been determined to not be present.					
Hoplocephalus bitorquatus Pale-headed Snake	Nov-Mar	Survey in dry weather only to minimise damage to sandstone, must not be too warm. As temperatures increase the species moves to utilising hollows in trees, often in sandstone gullies downslope of outcrops. Nocturnal surveys and spotlighting	Y	Stagwatch and nocturnal spotlighting	27/08/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is fragmented from any large areas of intact vegetation. Due to the highly degraded nature of the site this species is considered highly unlikely to occur on site.	The species was surveyed in August 2022, with no sightings confirmed on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N	N	N	N	N
Litoria aurea Green and Golden Bell Frog	Nov-Mar	Systematic day habitat search – one hour per stratification unit Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights BAM-C/TBDC Survey Period: Nov - Mar	Y	Nocturnal spotlighting and call playback	22/02/2023, 23/02/2023	A small dam and wet areas occur within the Subject Area and adjacent floodplain. Habitat is considered suitable for this species.	Field surveys targeting waterbodies, including small pools, failed to detect this species.	N	N	N	N	N
Litoria brevipalmata Green-thighed Frog	Sept-Apr	Systematic day habitat search – one hour per stratification unit Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights Survey: reliant on rainfall events for calling/breeding when it is usually detected/surveyed, strongly suggest >75 mm in 24 hrs or 150 mm over 72 hrs as the most probable time to survey and detect the species	Y	Nocturnal spotlighting survey and call playback	22/02/2023, 23/02/2023	A small dam and wet areas occur within the Subject Area and adjacent floodplain. Habitat is considered suitable for this species.	Field surveys targeting waterbodies, including small pools, failed to detect this species.	N	N	N	N	N
Lophoictinia isura Square-tailed Kite	Sept-Jan	Habitat assessment – 30 minutes searching each relevant habitat.	Y	Diurnal bird surveys	28/08/2022 07/09/2022 14/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is fragmented from any large areas of intact vegetation. Due to the highly degraded nature of the site with significant incidence of exotic species and lack of mid-stratum this species is considered highly unlikely to occur on site.	The species was surveyed in August and September 2022, with no sightings confirmed on site. Multiple sightings of the species have been found within 10km from the site with one record located 2.9km to the south. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date(s) Surveyed	Habitat (Present / Condition)	Comments	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Myotis Macropus Southern Myotis	Oct-Mar	16 nights with a minimum four nights of acoustic detectors, located in areas of greatest potential activity.	Y	Anabat Survey, nocturnal spotlighting and active anabat surveys around waterbodies.	27/09/2022 09/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site does not contain caves, mine shafts storm water channels, buildings or under bridges. However, the site does contain one farm dam and adjacent to a flood plain for potential foraging.	This species was surveyed in September and November 2022. Fourteen sightings of the species have been found within 10km from the site with one record located 2.9km from the Subject Site.	N	N	N	Y	Y
Ninox connivens Barking Owl	May-Dec	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset	Y	Nocturnal Surveys – Call playback, stagwatch and spotlighting	27/08/2022 28/08/2022 14/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is fragmented from any large areas of intact vegetation. Due to the highly degraded nature of the site this species is considered highly unlikely to occur on site.	The species was surveyed in August and September 2022, with no sightings recorded. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present.	N	N	N	N	N
Ninox strenua Powerful Owl	Apr-Dec	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset.	Y	Nocturnal Surveys – Call playback, stagwatch and spotlighting,	27/08/2022 28/08/2022 14/09/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is fragmented from any large areas of intact vegetation. Due to the highly degraded nature of the site this species is considered highly unlikely to occur on site.	This species was surveyed in August and September 2022 with no sightings on site. Fourteen sightings of the species have been found within 10km from the site with one record located 1.4km south of the Subject Site.	N	N	N	N	N
Petaurus norfolcensis Squirrel Glider	All year	Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights. Stagwatching - Observing potential roost hollows for 30 minutes prior to sunset and 60 minutes following sunset.	Y	Nocturnal Surveys – Call playback, stagwatch and spotlighting, camera trapping	27/08/2022 28/08/2022 27/09/2022 09/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the establishment of a mid-stratum. Due to the highly degraded nature of the site with significant incidence of exotic species and lack of mid-stratum this species is considered highly unlikely to occur on site	This species was surveyed in August and September 2022 with no sightings on site. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present	N	N	N	N	N
Phascogale tapoatafa Brush-tailed Phascogale	Dec-June	Camera Trapping Effort per stratification unit up to 50 hectares: Spotlighting on foot - 2 x 1 hour and 1km up to 200 hectares of stratification unit, walking at approximately 1km per hour on 2 separate nights.	N	Camera Trapping	09/11/2022 – 07/12/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. The site is regularly grazed by cattle & horses, preventing the establishment of a mid-stratum. Due to the highly degraded nature of the site with significant incidence of exotic species and lack of mid-stratum this species is considered highly unlikely to occur on site	This species was surveyed in November 2022 with no sightings recorded. No sighting of the species has been found within 10km from the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present	N	N	N	N	N

Species	Specified Survey Period (BAM – C)	Survey Guidelines	Surveyed in Season (Y/N)	Survey Method Undertaken	Date(s) Surveyed	Habitat (Present / Condition)	Comments	Records from Deployed Equipment	Observed Within Study Area (Y/N)	Observed within Subject Site (Y/N)	Assumed Present (Y /N)	Species Credits Apply (Y /N)
Phascolarctos cinereus Koala	All year	The minimum survey effort to detect koala presence on the subject land requires the total effort for two standard survey methods to be met. A scat detection method, which may indicate past occupancy, must be paired with a non-scat detection method as follows: 1. Spot Assessment Technique (SAT) (Section 4.1) or detection dogs (Section 4.2), and 2. spotlighting (Section 4.3) or passive acoustic (Section 4.4) or drones (Section 4.5). (Koala: BAM survey guideline, 2022)	Y	Koala SATs, Nocturnal surveys including call playback and spotlighting.	27/08/2022 23/11/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. Cattle and horses regularly use the site which can prevent the presence of the species. Due to the site lacking sufficient habitat of fallen timber including logs	This species was surveyed in August and November 2022 with no sightings on site. Three sightings of the species have been found in south-east and north-east of the site. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present	N	N	N	N	N
Tyto novaehollandiae Masked Owl	May-July	Call playback - Sites should be separated by 800 metres – 1km, and each site must have the playback session repeated as follows: • at least 5 visits per site, on different nights. Day habitat search: Search habitat for pellets, and likely hollows. Stag-watching: Observing potential roost hollows for 30mins prior to sunset and 60mins following sunset	N	N/A	27/08/2022 28/08/2022	The site contains a number of constraints that are likely to prohibit the presence of this species. Cattle and horses regularly use the site which can prevent the presence of the species. Due to the site lacking sufficient habitat of fallen timber including logs	This species was surveyed in August and November 2022 with no sightings on site. Five sightings of the species have been found within a 10km radius of the site with the closest located 1.9km. Due to the lack of local records and the degraded nature of the site, this species has been determined to not be present	N	N	N	N	N



AEP

Figure 5 - NSW BioNet Atlas Records

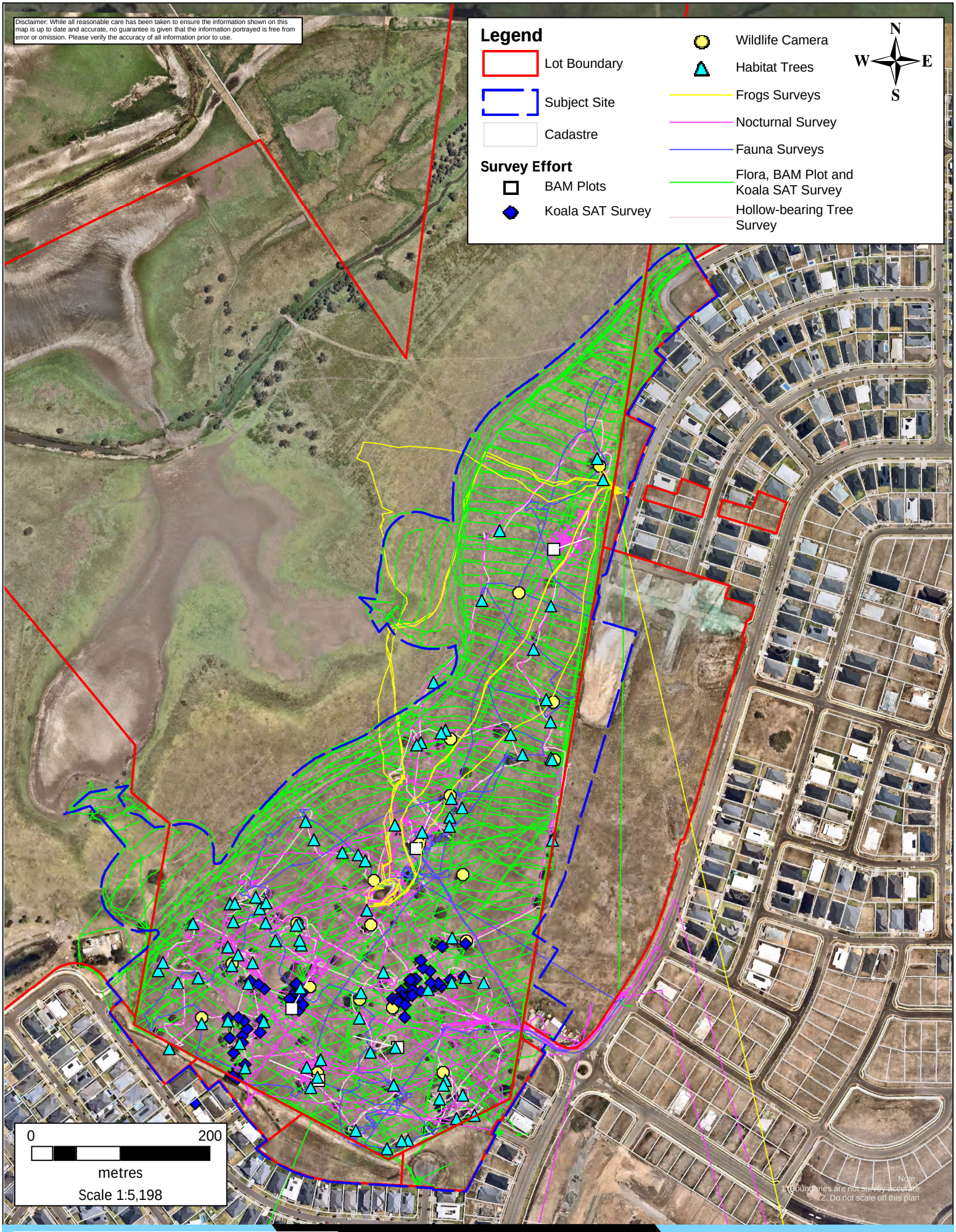
Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAMS: 36607

Client: Avid Property Group

AEP Ref: 1633.08



AEP

Figure 6 - Survey Effort

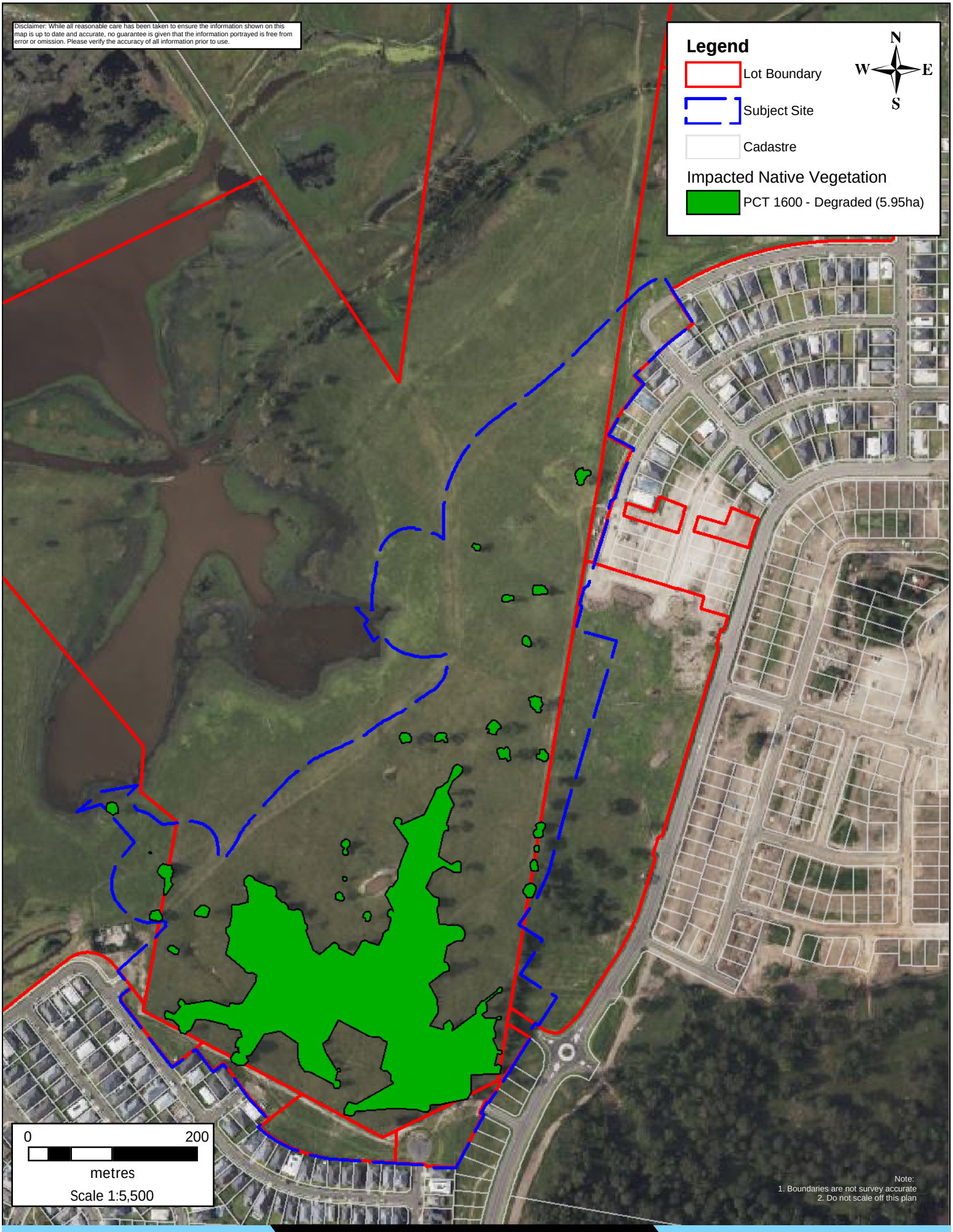
Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAMS: 36607

Client: Avid Property Group

AEP Ref: 1633.08



AEP

Figure 7 - Impacted Vegetation

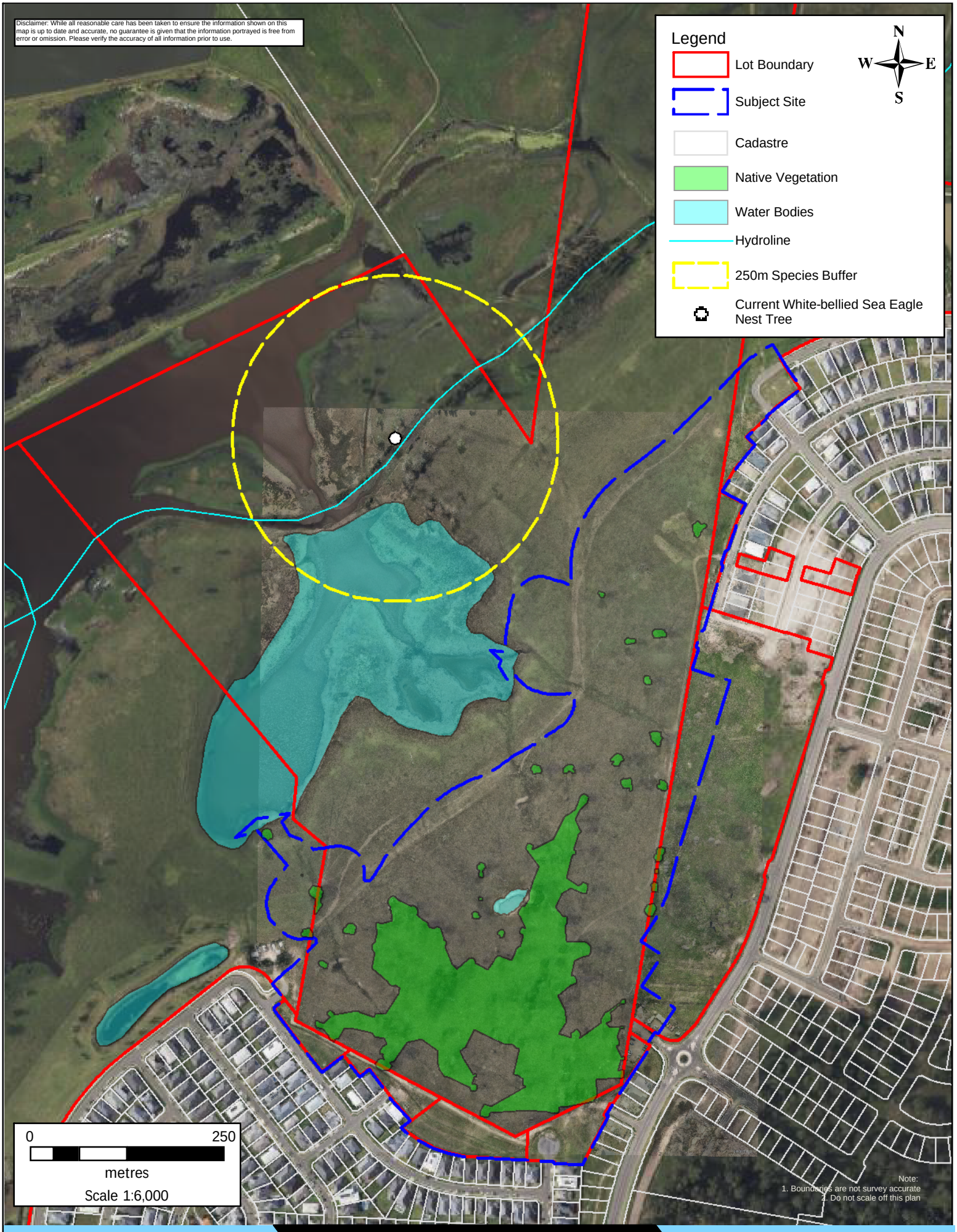
Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAMS: 36607

Client: Avid Property Group

AEP Ref: 1633.08



AEP

Figure 8 - White-bellied Sea Eagle Buffer

Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAMS: 36607

Client: Avid Property Group

AEP Ref: 1633.08

2.0 Stage 2 – Impact Assessment (Biodiversity Values)

2.1 Avoid and Minimise Summary

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

The Avoid and Minimise strategy for the development (in accordance with Section 8 of the BAM), is discussed in greater detail in **Table 16** below.

The prescribed impact risk assessment and mitigation measures (in accordance with Section 9 of the BAM) are included in **Tables 16** to **21** below.

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

2.2 Impact Avoidance Measures

2.2.1 Project Design

The Development Footprint is the result of a design process which has sought to incorporate natural constraints and existing location in proximity to the Berry Park township. It is located in an area which is already subject to disturbance with limited biodiversity and habitat value.

Areas of higher value lie approx. 5.1km south of the Subject Site; BV mapped land is located approx. 300m west; and the floodplain west of the Subject Site are to be retained, illustrating that the development is located within the most suitable, disturbed portions of the locality. The retained land within the floodplain is to be managed under a Biodiversity Management Plan (BMP). A known breeding pair of White-bellied Sea Eagles (Refer to **Figure 8**) has relocated to this area from within the Subject Site and this species is likely to benefit from enhancing the biodiversity values of this area as part of a BMP.

2.2.2 Biodiversity Management Plan

The areas of BV mapped land located approx. 300m west on the floodplain of the Subject Site and are proposed to be regenerated and managed under a Biodiversity Management Plan. The purpose of this plan is to regenerate riparian lands and increase biodiversity values within the floodplains, while incorporating best practice management of vegetation and fauna within the BMP Lands.

The overall BMP objectives proposed for the BMP are:

- Regeneration of riparian vegetation;
- Improving water quality and aquatic habitat;
- To assess and adjust weeding and planting regimes across the BMP;
- Protecting areas of habitat for native flora and fauna, including locally occurring threatened species (Known breeding pair of White-bellied Sea Eagles); and
- A long-term environmental conservation area, in a state of Natural Regeneration requiring nominal ongoing maintenance.

2.2.3 Water quality and Hydrology

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

2.2.4 Tree Management

- Landscape tree plantings should use species that are commensurate with the surrounding vegetation community where practical.

2.2.5 Fencing

No barbed wire is to be used within the Subject Site. Fencing within the Subject Site is to prevent incursions by fauna into the construction site; and following completion protection from vehicle strike and domestic pets.

2.2.6 General Construction & Operation

Site specific Avoid and Minimise measures are discussed in **Table 17** and **Table 18**, while **Table 19** and **Table 20** outline the direct and indirect impacts associated with the development and how they are to be mitigated. The development's 'Avoid and Minimise' strategy (in accordance with Section 8 of the BAM), is discussed in greater detail in **Table 22** below.

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

- For the clearing phase, retained vegetation located on the edges of the development footprint will be delineated by flagging tape, fencing and signage indicating an environmental protection zone. This will allow fauna to egress the development area as needed. Following the completion of clearing works, permanent delineation features such as logs should be installed to protect the retained vegetation during operational phase of the development;
- Vegetation clearing is to be timed to avoid cold weather periods where overnight temperatures are forecast to be less than 12°C. Cold weather is likely to make it difficult for resident hollow dependent fauna to successfully relocate. This is particularly relevant for low body-weight species;
- A staged approach to clearing is to be undertaken to provide fauna the opportunity to disperse outside the area of impact. Staging to include Phase 1 Clearing: Underscrubbing, Phase 2 Clearing: Removal of non-habitat trees, and Phase 3 Clearing: Removal of habitat and connecting trees;
- All clearing works are to be undertaken under the supervision of the Project Ecologist;
- Clearing should occur in a direction from previously disturbed lands towards retained lands. In this case east to west is advised;
- Implement clearing protocols, including pre-clearance surveys to identify habitat and vegetation to be retained;

- All clearing works are to be attended by a suitable equipped and experienced ecologist to deal appropriately with any displaced fauna species;
- All hollow-bearing features will be sectionally lowered by tree climbers (where safe to do so);
- Any fauna rescued during vegetation clearing is to be assessed for injuries, and subsequently released to a suitable nearby location; this may require holding fauna until dusk for release in accordance with relevant animal ethics licencing and standards;
- If any fauna is injured during vegetation clearing, they are to be taken promptly to a nearby veterinarian or suitable wildlife carer contact;
- In addition, prior to clearing of any vegetation, an ecologist is to inspect the area for any signs of resident fauna requiring attention, and in particular nesting birds. Where such is identified, appropriate strategies are to be developed and instigated to minimise impacts. Pre-clearance surveys to include diurnal surveys, stag watching and nocturnal surveys;
- Civil Construction staff are to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection;
- Installation of nest boxes within the retained lands prior to construction to mitigate the removal of HBTs within the development footprint and provide supplementary roosting / nesting habitat for resident fauna species that utilise such features;
- Any suitable hollows recovered during clearing works should be reconditioned into suitable hollows and installed in retained lands in addition to the manufactured nest boxes;
- All manufactured boxes are to be industry best-practice including either marine or hardwood plywood with a minimum thickness of 15mm;
- Boxes will have hinged lids to enable maintenance of the boxes;
- Installation methods are to be used that will not inhibit growth of the host tree;
- All cleared vegetation is to be mulched on site and spread to help stabilise any exposed soil and minimise offsite movement of biomass. Fallen timber and hollow logs identified to be retained to be relocated into the retained lands;
- Live mulch and topsoil of local provenance is an ideal way to begin rehabilitation of conservation lands;
- Plantings will be incorporated in the landscape design of the proposed development site to provide future resources for native fauna in the area;
- Implement hygiene protocols for machinery are to prevent the spread of weeds outside the development site;
- Best practice erosion and sedimentation (ERSED) and dust suppression control methods are to be adopted, monitored and maintained throughout any vegetation clearing works, particularly for downstream areas. Such are to be in accordance with “Soils and Construction – Managing Urban Stormwater” published by Landcom;
- Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise downstream hydrology changes; and
- Any bushfire protection measures in the form of Asset Protection Zones (APZs) or defendable space are to be incorporated within the development footprint to avoid requirements for additional vegetation removal in surrounding areas.

Table 16 – Avoid and Minimise Impacts on Biodiversity Values

Objectives/Requirements	Evidence of compliance
Locate the proposal to avoid or minimise direct and indirect impacts on native vegetation, threatened species, threatened ecological communities and their habitat.	
Knowledge of biodiversity values should inform decisions about the location of the proposal. The initial assessment of biodiversity values from Stage 1 may be used to inform the early planning of the route or location of a proposal.	The proposed subdivision design is the result of an iterative process which has sought to avoid impacts to biodiversity values by selecting a location with lower biodiversity value.
Selecting a final proposal location may be an iterative process. Decisions may need to be revisited after all field surveys have been completed.	Surveys were undertaken on the basis of the proposed development design as shown in **Appendix A.** Once surveys were completed, it was confirmed that the proposed location to be developed was optimal considering the avoidance of BV mapped land and sensitive floodplain areas.
Impacts from clearing native vegetation and threatened species habitat can be avoided or minimised by locating the proposal in areas: *a) lacking biodiversity values* *b) where the native vegetation or threatened species, habitat is in the poorest condition (i.e. areas that have a low vegetation integrity score)* *c) that avoid habitat for species with a high biodiversity risk weighting or land mapped on the important habitat map, or native vegetation that is a TEC or a highly cleared PCT.* d) *outside of the buffer area around breeding habitat features such as nest trees or caves.*	a) The proposed location of the subdivision was chosen on the basis of its adjacency to the existing urban growth corridors of the Berry Park township and its occurrence on disturbed land, with areas of higher biodiversity values being retained within the Study Area. b) The proposed subdivision is located on areas primarily consisting of disturbed grassland and scattered remnant forest. The majority of vegetation within the impact area comprises pasture improved degraded land with a low VIS or has a VIS not exceeding 15. As part of the proposed development, an area is proposed to be revegetated within the floodplain where a pair of White-bellied Sea Eagles have relocated to improve habitat values for this species. c) The Subject Site does not impact upon any habitat for threatened species, however the proposal impacts a TEC. d) No habitat features are currently being used for breeding by threatened species. There are no areas of important habitat mapped for Regent Honeyeater, Swift Parrot, or migratory shorebirds within the site. An unoccupied White-bellied Sea-Eagle nests are located within the Subject Site. These individuals now occupy a nest to the west of the Subject Site which is proposed to be managed as part of a BMP. Further information can be found in **Appendix H** and **Figure 9**.
When selecting a proposal's location, all of the following should be analysed. Justification for the decisions in determining the final location must be based on consideration of: *a) alternative modes or technologies that would avoid or minimise impacts on biodiversity values* *b) alternative routes that would avoid or minimise impacts on biodiversity values* *c) alternative locations that would avoid or minimise impacts on biodiversity values* *d) alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values.*	a) Water Sensitive Urban Design will be implemented to minimise impacts on biodiversity values linked to hydrology and water quality. b) The location of the proposed routes when considering the existing road network and avoidance of areas of higher biodiversity value are considered to be optimal. c) The design process has sought to avoid most areas of higher biodiversity values located in the west of the Study Area. The proposed Subject Site is located in an area predominantly comprised of pasture improved degraded land that is actively grazed. d) As mentioned previously, the proposal footprint is designed in areas of low biodiversity value. It is advised that revegetation is to be completed where possible along the western side adjacent to the proposed development creating a buffer between the Subject Site and the floodplains.
The proposal may also list and map site constraints, such as: *a) bushfire protection requirements, including clearing for asset protection zones* *b) flood planning levels* *c) servicing constraints.*	Bushfire protection zones have been provided over perimeter roads, existing infrastructure buffers, and cleared areas surrounding the development where required in accordance with bushfire protection requirements. Servicing constraints have been considered and the proposal has met the required standards. Residential lots are located outside the flood planning area defined by Maitland LEP 2011 Flood Planning Map. Flood management is addressed in the SEE. To the west of the Subject Site is located within the flood plain, regeneration within this area should be selected to withstand inundation during flood events. .
In the BDAR or BCAR, the assessor must document and justify any actions taken to avoid or minimise impacts through careful location of the proposal.	As detailed above, the final development footprint is the most feasible option. Considering the location of the development footprint in the context of the site, it has the least impact to biodiversity values, native vegetation, connectivity routes and fauna movements.
Designing a Project to Avoid and Minimise Impacts on Native Vegetation and Habitat	
The BDAR or BCAR must document the reasonable measures taken by the proponent to avoid or minimise clearing of native vegetation and threatened species habitat during proposal design, including placement of temporary and permanent ancillary construction and maintenance facilities. The types of measures that can be used to demonstrate this include: *a) Reducing the proposal's clearing footprint by minimising the number and type of facilities* *b) Locating ancillary facilities in areas that have no biodiversity values* *c) Locating ancillary facilities in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas with the lowest vegetation integrity scores)* *d) Locating ancillary facilities in areas that avoid habitat for species and vegetation that has a high threat status (e.g. an endangered ecological community (EEC) or critically endangered ecological community (CEEC) or is an entity at risk of a serious and irreversible impact (SAII)* *e) Actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.*	a) The proposal has been designed to follow the principles of avoid and minimise by utilising the lower quality cleared land that continues to be managed and grazed. b - d) All infrastructure required for the Subject Site has been designed either within areas already required to be cleared as part of roads or to avoid as much native vegetation as possible. e) Appropriate protection measures during and after construction, including fencing will be implemented to avoid any impacts to adjacent areas of higher biodiversity value particularly along the western boundary where the floodplain will be managed under a BMP.
The BDAR or BCAR must document and justify efforts to avoid or minimise impacts through design.	Details of proposed avoidance and minimisation measures are provided in **Tables 13-18**.

Table 17 – Prescribed Impact Avoidance and Minimisation

Objectives/Requirements	Evidence of compliance
Avoiding and Minimising Prescribed Biodiversity Impacts during Project Planning	
The timing and extent of a prescribed impact on the habitat of threatened entities can be difficult to assess and adequately offset through the provision of biodiversity credits. Prescribed impacts may occur on habitat features that are not native vegetation, e.g., caves, rocky outcrops and flyways. Because these types of features cannot be readily replaced or offset, it is important that measures to avoid or minimise impacts are undertaken and are clearly documented in the BDAR or BCAR.	No biodiversity values in addition to those noted in the BDAR i.e., direct and indirect impacts to biodiversity were identified for the Subject Site. Direct and indirect impacts are considered in **Tables 18, 19** and **20** of the BDAR.
Locating a Project to Avoid and Minimise Prescribed Biodiversity Impacts	
To avoid or minimise prescribed biodiversity impacts, the proponent must consider how to: *a) Locate surface works to avoid direct impacts on the habitat features identified in Chapter 6* *b) Locate subsurface works, in both the horizontal and vertical planes, to avoid and minimise operations beneath the habitat features identified in Chapter 6. For example, locating longwall panels away from geological features of significance, groundwater-dependent plant communities and their supporting aquifers* *c) Locate the proposal to avoid severing or interfering with corridors connecting different areas of habitat and migratory flight paths, to important habitat or local movement pathways* *d) Optimise the proposal layout to minimise interactions with threatened entities; for example, design a wind farm that has:* *i. 100 m turbine-free buffers around features that attract and support aerial species, such as forest edges, riparian corridors, wetlands, ridgetops and gullies* *ii. turbine-free corridors in zones of regular movement for species of concern, to avoid a barrier effect* *e) locate the proposal to avoid impacts on water bodies or hydrological processes*	a) The Subject Site: i. Does not contain karsts, caves, crevices, cliffs, abundant small rocks and boulders and boulder piles. No other features of geological significance supporting threatened species and ecological communities are present; ii. Does not contain rocks as discussed above, which may support habitat for threatened species; iii. Does not contain human made structures within the Subject Site. iv. Does not contain non-native vegetation supporting threatened species but threatened ecological communities present; v. Wind turbines are not a feature of the development proposed. vi. Given that the development will be for local roads with a maximum speed limit of 50km/hr, the likelihood of vehicle strike is considered much lower than higher speed roads. b) No sub-surface work is expected as a result of the proposed development. c) The land on which the development is proposed would only provide connectivity between different areas of habitat for highly mobile species as the site is fragmented from other areas of vegetation. Areas of retention will continue to provide habitat and connectivity to highly mobile species. d) Discussed above. e) The Subject DA Footprint will impact upon one (1) manmade farm dam.
When locating a proposal, the following need to be analysed and justification should be provided for each alternative selected: *a) alternative modes or technologies that would avoid or minimise prescribed impacts* *b) alternative routes that would avoid or minimise prescribed impacts* *c) alternative locations that would avoid or minimise prescribed impacts* d) *alternative sites within a property on which the proposal is located that would avoid or minimise prescribed impacts.*	a) Water Sensitive Urban Design will be implemented to minimise prescribed impacts on biodiversity values linked to hydrology and water quality. b) The proposed development has been designed to ensure all infrastructure have been located in cleared areas outside the development footprint or within proposed road reserves. c) The development footprint was considered to be the most appropriate due to the location and degraded condition of remnant native vegetation. Alternative locations would have led to higher impacts on biodiversity and as such, the current location is considered to be optimal in the context of the parent lot. d) Discussed above.
Justifications for a proposal's location should identify any other site constraints that the proponent has considered in determining the location and design of the proposal, such as: *a) bushfire protection requirements, including clearing for asset protection zones* *b) flood planning levels* *c) servicing constraints.*	a) AEP understand all required asset protection zones (APZs) and defendable spaces are contained within the proposed Subject Site. b) AEP understand flood planning levels and servicing constraints have been considered and the proposal has met the required standards. c) Access and services will be provided via existing carriageways and infrastructure.
The assessor must document and justify in the BDAR or BCAR all efforts to avoid, or the reasonable measures proposed to minimise, prescribed impacts when choosing the proposal's location.	Discussed above.
Designing a Project to Avoid and Minimise Prescribed Biodiversity Impacts	
Design measures that can avoid or minimise prescribed impacts include: *a) Engineering solutions, such as proven techniques to:* *i. Minimise fracturing of bedrock underlying features of geological significance, or groundwater-dependent communities and their supporting aquifers* *ii. Restore connectivity and movement corridors* *b) Design elements that minimise interactions with threatened entities, such as:* *i. Designing turbines to dissuade perching and minimise the diameter of the rotor swept area* *ii. Designing fencing to prevent animal entry to transport corridors* *iii. Providing vegetated buffers rehabilitated with native species* *c) Maintaining environmental processes that are critical to the formation and persistence of habitat features not associated with native vegetation* *d) Maintaining hydrological processes that sustain threatened entities*	a) i. Proposed works will not impact on features of geological significance, groundwater dependent communities or supporting aquifers. ii. No corridor connectivity is available in close vicinity of the Subject Site, therefore no avoid and / or minimise measures are applicable. b) It is recommended that powerlines be buried rather than overhead so that flight paths for threatened fauna in the locality are maintained and avoid impacts such as powerline strike. A rural style 'post and rail' fence placed at the edge of the proposed development is recommended along with a low-speed limit within the development will mean that in the event fauna enter the Subject Site, they are unlikely to be struck by vehicles. c) The project has been designed to reduce filling as much as is feasible in order to minimize downstream impacts. Implementation of WSUD will be incorporated into the project design. d) As per point i. e) The project design process incorporates MUSIC (Model for Urban Stormwater Improvement Conceptualisation) water quality modelling to determine stormwater treatments to ensure post-development water quality at least maintains pre-development conditions.

Objectives/Requirements	Evidence of compliance
e) Controlling the quality of water released from the site, to avoid or minimise downstream impacts on threatened entities.	
The proposed measures must be evidence-based and directed towards the threatened entities identified in Chapter 6. The BDAR or BCAR must document the designs that are proposed to avoid or minimise prescribed impacts	Field surveys have been carried out to identify threatened species within the area. The development has been designed to follow the principles of avoid and minimise by utilising cleared and degraded land where possible. Due to loss of native vegetation and hollow bearing trees, nest boxes will be required where possible in the advised revegetation area to provide suitable habitat for arboreal fauna to further mitigate any impacts to the development.

2.3 Assessment of Impacts

Section 8 of the BAM states that the BDAR "must assess the impacts of the project on native vegetation and habitat. In addition to this, Sections 9.1.4 and 9.2 require that further assessment be produced for any impact, including biodiversity impacts, expected in land surrounding the Subject Site. **Tables 18** to **23** provide a summary of measures proposed to avoid and minimise direct, indirect, prescribed and residual impacts on biodiversity.

Table 18 – Direct Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Native vegetation	Construction and Operation	Removal of 5.95ha of native vegetation including potential habitat for 89 ecosystem credit species.	The proposed subdivision is located within degraded and highly degraded native vegetation. Areas of higher biodiversity are located to the west of the Subject Site. Vegetation within the BMP lands will be regenerated to assist in mitigating the impacts of the development. This will include, where relevant, compensatory habitat in the form of nest boxes installed to compensate for the loss of hollow-bearing trees.	Operation and Post-operation	Council Project coordinator	HR	MR
Habitat in the form of tree hollows	Pre-Construction and Construction	Removal of tree hollows providing habitat for native birds and mammals. Removal of 84 HBTs with potential for use by fauna	Hollows removed during the clearing process will be replaced where possible in the regeneration area. Salvaged hollows and/or nest boxes are to be installed by qualified ecologists and according to the Habisure system (Franks & Franks 2006) or similar.	Pre-Construction	Project coordinator Project Ecologist	HR	MR
Fauna home range and connectivity	Pre-Construction and Construction	Disturbance to fauna habitat during pre-operation clearing and construction.	Installation of a fauna-protecting fence, including relevant signage, to create a fauna protection zone which coincides with the tree protection zone. A permanent fence should be installed once construction of the new development is complete.	Pre-, during and post-operation	Project coordinator Construction staff Site manager Project Ecologist	HR	LR
Fauna home range and connectivity	Operation	Reduction in connectivity	No additional reduction in connectivity is proposed within the development. Existing connectivity is very limited and currently only serving highly mobile species. It is recommended that landscaping and restoration within BMP lands, using native species commensurate with the local vegetation communities, will assist in improving connectivity in the future.	Pre-, during and post-operation	Council Project coordinator Ecologists	MR	LR
Reduction of biodiversity values	Pre-Construction, Construction and Operation	Damage to retained trees	Installation of a fence as per the item above, including relevant signage, to create a tree protection zone where relevant Communication of fence location and mapping to all staff involved in clearing and construction operations. Regular inspection of fence by Project Ecologist to monitor and fix if and where necessary.	Pre- and during-operation	Project coordinator Construction staff Site manager Project Ecologist	HR	LR
	Construction	Sediment run-off into retained vegetation area	Best practice erosion and sedimentation (ERSED) control methods to be adopted, enforced and maintained throughout vegetation works, so as to avoid any movement of sediment resulting from clearing and construction into the retained vegetation lands. Where practical, clearing and excavation will be restricted to drier periods.	During development	Project coordinator Construction staff Site manager Project Ecologist	MR	LR
		Change in stream flow and structure	Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise hydrology changes.	During development and Operational	Project coordinator Construction staff Site manager Project Ecologist	MR	LR

Table 19 – Prescribed Impact Assessment

Subject of Prescribed Impact	Project Phase	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Habitat of threatened species or ecological communities associated with: (i) Karst, caves, crevices, cliffs and other geological features of significance or (ii) rocks, or (iii) human made structures, or (iv) non-native vegetation	No human-made structures or abundant small rocks, boulders and boulder piles are present within the Subject Site. No other features of geological significance supporting threatened species and ecological communities are present.					
Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range	Construction and operation	No additional reduction in connectivity is proposed within the development due to connectivity already being very limited.	Pre-operation and operation	Council Project coordinator Project Ecologist	MR	LR
Movement of threatened species that maintains their lifecycle	Construction and operation	No threatened species were found to be utilising the site. White-Bellied Sea-Eagle individuals currently occupy a nest in close proximity west of the site but may only use habitat in the Subject Site for foraging (refer to **Appendix H** and **Figure 8**).	Pre-operation and operation	Council Project coordinator Project Ecologist	MR	LR
Water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities	Construction and operation	Incorporation of Water Sensitive Urban Design (WSUD) principles within stormwater infrastructure is to occur to minimise hydrology changes. Best practice erosion and sedimentation (ERSED) control methods to be adopted, enforced and maintained throughout vegetation works, so as to avoid any movement of sediments resulting from clearing and construction into the retained vegetation lands.	Pre-operation and operation	Project coordinator Project Ecologist	MR	LR
Wind turbine strikes on protected animals	No wind turbines will be installed on site. Not applicable.					
Vehicle strikes on threatened species or on animals that are part of a TEC	Construction and operation	Civil Construction staff to be inducted into pre-clearing and clearing protocols, and to identify environmental features for protection. During operation, such impacts will be mitigated through the introduction of low-speed limits as well as speed limiting devices on the precinct's roads.	Pre-operation and operation	Project coordinator Construction staff Site manager Project Ecologist	HR	MR

Table 20 – Indirect Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation	Timing	Responsibility	Risk before mitigation	Risk after mitigation
Noise	Pre-operation and Construction	Noise during construction due to clearing works and related vehicular traffic. Potential disturbance to threatened species or reduced viability of adjacent retained habitat zone.	Timing of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP) which will include a Noise Mitigation Plan.	Pre-operation and Operation	Project coordinator Construction staff Site manager	HR	MR
	Operation	Noise due to traffic. Potential disturbance to threatened species within the surrounding area.	Vegetative buffers have been recommended and will aide in reducing noise. Standard residential speed limits will apply, limiting traffic noise.	During operations and Operational	Civil Contractor	MR	LR
Vibration	Construction	Disturbance to fauna which may lead to displacement to adjacent areas.	Conditions of construction operations will be optimised as per an approved Construction Environmental Management Plan (CEMP).	During construction	Project coordinator Site manager Construction staff	HR	MR
Dust	Construction	Dust deposits on native flora and fauna habitat, resulting in disturbance to and reduced viability of adjacent habitat.	Dust levels during operations managed according to an approved CEMP: • Daily monitoring of dust generated by construction activities; and • Dust suppression measures (setting maximum speed limits and application of dust suppressants) will be implemented during construction works to limit dust on site.	During construction	Project coordinator Site manager Construction staff	LR	LR
Light spill	Construction	Disturbance to nocturnal fauna, thus reducing viability of the adjacent habitat.	Optimal construction methods as per an approved CEMP will reduce instances of light spill. Such measures will include limiting use of lights where necessary and directing lights in such a way as to limit impact on adjacent vegetated lands. Light-sensitive threatened species are unlikely to occur on site.	During construction	Project coordinator Site manager Construction staff	LR	LR
	Operation	Disturbance to nocturnal fauna, thus reducing viability of adjacent retained habitat zone.	Provision of lighting will be in accordance with an approved CEMP. Permanent lighting shall be designed to minimise light spill into surrounding vegetation.	During operations	Civil Contractor	MR	LR
Non-native vegetation	Construction	Soil disturbance may lead to proliferation of exotic flora (including invasive weeds) through seeds and vegetation fragments.	As per an approved CEMP: • Appropriate handling of mulch created from the removal of exotic vegetation; • Appropriate cleaning of all construction equipment to limit the risk of weed seed and fragments to adjacent retained areas; and • Chemical and manual treatment of weeds where applicable.	During construction	Project coordinator Site manager Construction staff	MR	LR
Visual amenity	Construction	Rubbish and waste retained onsite attracting native fauna.	Activities on the Site will be managed in accordance with an approved CEMP and designed to limit the amount of rubbish and waste onsite through good housekeeping practices.	During construction	Project coordinator Site manager Construction staff	LR	LR
	Operation	Rubbish and waste retained onsite attracting native fauna.	Suitable fencing to be installed and maintained between development and surrounding natural areas to deter access and degradation of retained lands.	During operations	Civil Contractor	LR	LR

Table 21 – Residual Impact Assessment

Aspect	Project Phase	Potential Impact	Mitigation / Minimisation	Residual Impact Description	Impact to be offset (see Section 2.3.2)
Reduction of biodiversity values	Construction Operation	Clearing of 5.95ha of native vegetation	The Subject Site has been located to avoid areas of higher biodiversity values. Biodiversity values within the BMP lands will continue to increase following the proposed development. It is therefore considered to be situated in an optimal part of the parent lot.	PCT 1600 – 5.95ha	Yes
		Removal of 84 HBTs with potential for use by fauna	Installation of 84 nest boxes, as well as any recovered hollows in the Subject Site. To be installed within retained lands and across the broader parent lot.		Yes
Noise, dust, light spill	Pre-operation and Operation	Disturbance to local fauna	Application of CEMP as mentioned above.	Noise, dust and light spill will still occur but a low magnitude, thus keeping the impact on local fauna to a low level.	No

Table 22 – Risk Matrix

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

CRITICAL	CR
HIGH RISK	HR
MEDIUM RISK	MR
LOW RISK	LR

Table 23 – Assessment Criteria

Consequence criteria: Impacts on threatened species and/or threatened species habitat
1. CRITICAL Impact – Severe; Spatial scale – Widespread; Time scale – Long-term. Requires consideration of whether impacts may result in a Serious and Irreversible Impact that may lead to local extinction. **2. MAJOR** Impact – Moderate; Spatial scale – Moderate to widespread; Time scale – Mid- to long-term. May result in temporary or long-term damage. **3. MODERATE** Impact – Moderate; Spatial scale – Local to moderate; Time scale – Short- to mid-term. May result in a moderate, temporary impact. However, it may be difficult to rehabilitate impact and may have negative implications on the ecosystem **4. MINOR** Impact – Minor; Spatial scale – Local; Time scale – Short-term. May result in minor impacts that are relatively easily rehabilitated. Not likely to have negative implications on the ecosystem. **5. NEGLIGIBLE** Impact – Minor; Time scale – Short-term with no lasting effect.
Likelihood criteria
A. ALMOST CERTAIN Very high or certain probability that impact will occur, or event is of a continuous nature. **B. LIKELY** Likely probability that impact will occur, or event is frequent (frequency 1-5 years). **C. MODERATE** Moderate probability that impact will occur, or event is infrequent (frequency 5-20 years). **D. UNLIKELY** Low probability that impact will occur, or event is very infrequent (frequency 100 years). **E. REMOTE** Very low probability that impact will occur or may occur under extenuating circumstances. Event is very rare or stochastic in nature (frequency 1000 years)

2.4 Summary of Potential Impacts on Biodiversity

2.4.1 Prescribed Impacts Requiring Offsetting

No prescribed impacts are relevant to the Subject Site.

2.4.2 Vegetation Clearance Requiring Offsetting

The development would result in the loss of approx. 5.95ha of native vegetation. The future Vegetation Integrity Scores will be zero for all development areas.

The BAM Calculator valued the loss of 5.95ha of PCT 1600 (Degraded) at 89 Ecosystem Credits.

2.4.3 Species Credit Species

Myotis Macropus was assumed to be present the Subject Site, a total of 58 species credits are required to offset the proposed development. Impact areas requiring offset are shown in **Figure 9 (r**efer to **Table 25**).

2.4.4 Vegetation Clearance Not Requiring Offsetting

Vegetation clearance not requiring offsetting includes 24.17ha of exotic grassland, exotic canopy, manmade dams and access tracks.

2.4.5 Impacts requiring offset

2.4.5.1 Ecosystem Credits

As per Section 10.3 of the BAM, the removal of native vegetation within the site will require offsetting to achieve the 'no net loss standard' detailed within Section 11 of the BAM. To calculate the required offsets in the form of ecosystem credits, the BAM Calculator has taken into consideration the impact area and the projected loss in vegetation integrity score along with the biodiversity risk weighting of the PCT. Details of each along with the required credit outputs is provided in **Table 24**. A total of 89 ecosystem credits are required to offset the proposed development. Impact areas requiring offset are shown in **Figure 7**.

2.4.5.1 Species Credits

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

Myotis Macropus was detected within the Subject Site, a total of 58 species credits are required to offset the proposed development. Impact areas requiring offset are shown in **Figure 9** (refer to **Table 25**).

Table 24 – Ecosystem Credit Requirements

Vegetation Zone	Condition	Impact Area (ha)	Future VIS	Vegetation Integrity Score Loss	Biodiversity Risk Weighting	Credit Requirements
PCT 1600	Degraded	5.95	-	29.9	2	89

2.4.5.2 Species Credits

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

Table 25 –Species Credit Requirements

PCT	Condition	Impact Area (ha)/count	Biodiversity Risk Weighting	Credit Requirements
***Myotis Macropus* (Southern Myotis)**				
PCT 1600	Degraded	3.9	2	58

2.5 Biodiversity Credit Report

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

AEP

Figure 9 - Southern Myotis Species Polygon

Date: June 2023

Location: 24 Duckenfield Road, Berry Park

BOAMs: 36607

Client: Avid Property Group

AEP Ref: 1633.08

3.0 Conclusion

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

The vegetation within the site was found to be commensurate with 1600. The remainder of the site predominantly comprised non-native grazed pasture / cleared areas.

The proposal will require impact to 5.95ha of native vegetation described as PCT 1600. As a result, a total of 89 Biodiversity Offsets Credits will be required to be retired to offset the residual impacts to native vegetation and achieve a no net loss standard.

Myotis macropus (Southern Myotis) was assumed to be present based on knowledge of the area and suitable habitat present within the Subject Site. As a result, impacting suitable native vegetation commensurate with PCT 1600 within 200m of the dam requires to be offset by 58 Species Offset Credits.

4.0 References

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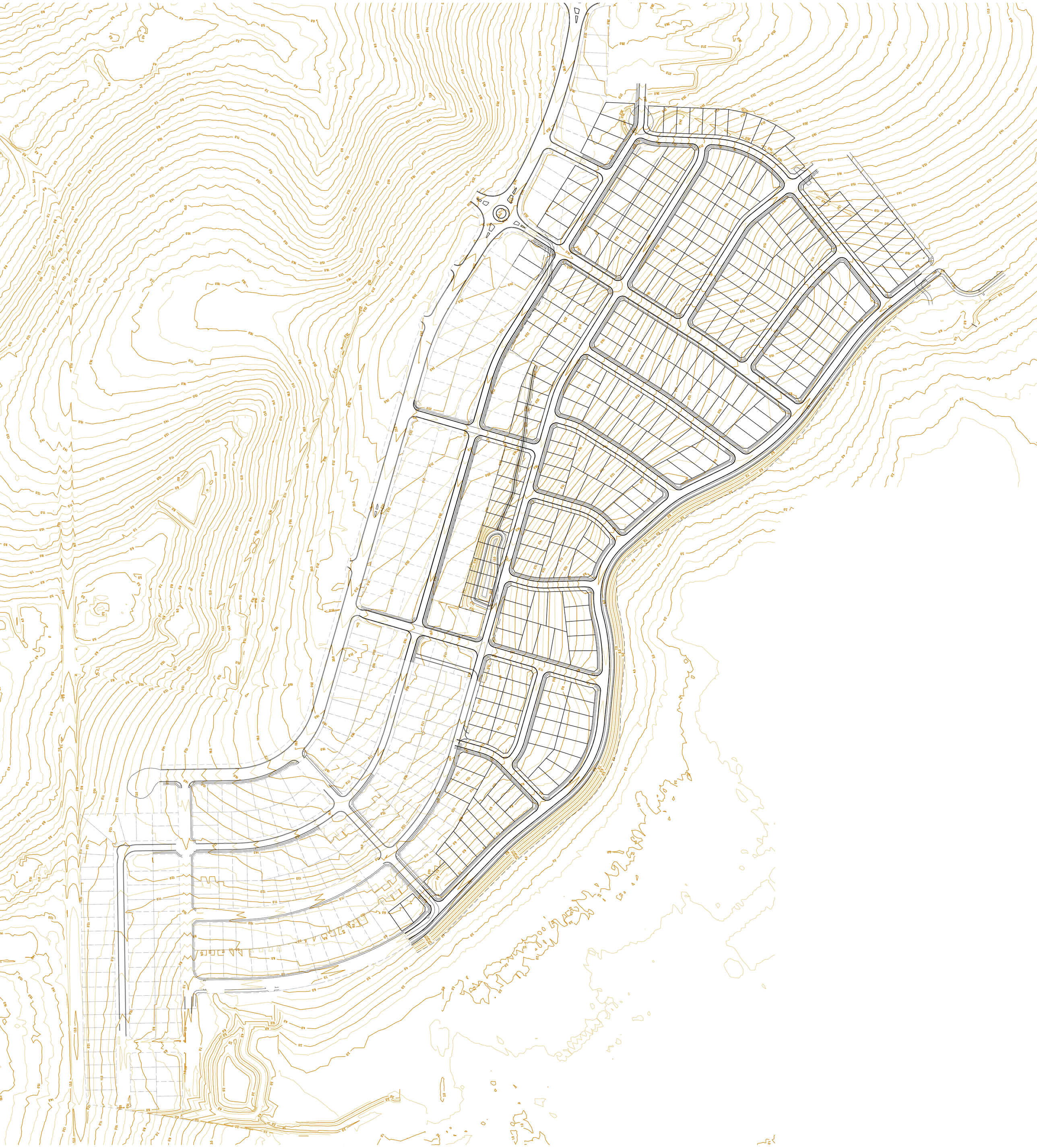
Appendix A – Development Plan



Appendix B – Flora Species List

Family	Scientific Name	Common Name
Apiaceae	*Centella asiatica*	Swamp Pennywort
Asteraceae	*Euchiton spp.*	A Cudweed
Asteraceae	*Gamochaeta purpurea*	
Asteraceae	*Hypochaeris radicata**	Flatweed
Asteraceae	*Pseudognaphalium luteoalbum*	Cudweed
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Soliva sessilis**	Bindii
Asteraceae	*Epaltes australis*	Spreading Nut-heads
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew
Cyperaceae	*Cyperus tenellus**	
Cyperaceae	*Schoenus apogon*	Fluke Bog-rush
Fabaceae	*Trifolium campestre**	Hop Clover
Fabaceae	*Trifolium repens**	White Clover
Gentianaceae	*Centaurium erythraea**	Common Centaury
Geraniaceae	*Erodium spp.**	Crowfoot
Goodeniaceae	*Velleia paradoxa*	
Iridaceae	*Romulea rosea**	
Juncaceae	*Juncus cognatus**	
Juncaceae	*Juncus spp.*	
Juncaceae	*Juncus usitatus*	Common Rush
Lobeliaceae	*Lobelia purpurascens*	Whiteroot
Lomandraceae	*Lomandra filiformis*	Wattle Matt-rush
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush
Lythraceae	*Lythrum hyssopifolia*	Loosestrife
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Myrtaceae	*Corymbia maculata*	Spotted Gum
Myrtaceae	*Eucalyptus fibrosa*	Broad Leaved Ironbark
Oxalidaceae	*Oxalis perennans*	Yellow-flowered Wood Sorrel
Pittosporaceae	*Bursaria spinosa*	Native Blackthorn
Plantaginaceae	*Plantago lanceolata**	Ribwort
Poaceae	*Aristida vagans*	Three-awn Speargrass
Poaceae	*Briza minor**	Shivery Grass
Poaceae	*Cenchrus clandestinum**	Kikuyu
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass
Poaceae	*Entolasia stricta*	Wiry Panic
Poaceae	*Eragrostis brownii*	Brown’s Lovegrass
Poaceae	*Lachnagrostis filiformis*	Blown Grass

Family	Scientific Name	Common Name
Poaceae	*Lolium perrenne**	Perennial Ryegrass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Paspalidium distans*	
Poaceae	*Paspalum dilatatum**	Paspalum
Poaceae	*Poa annua**	Winter Grass
Poaceae	*Rytidosperma fulvum*	Wallaby Grass
Poaceae	*Sporobolus africanus**	Parramatta Grass
Poaceae	*Vulpia myuros**	Rat's Tail Fescue
Poaceae	*Dichelachne micrantha*	
Polygonaceae	*Persicaria lapathifolia*	Pale Knotweed
Polygonaceae	*Rumex crispus**	Curled Dock
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel
Solanaceae	*Solanum nigrum**	Black Nightshade, Black-berry Nightshade
Solanaceae	*Solanum spp.**	
Verbenaceae	*Verbena bonariensis**	Purpletop

* Denotes an exotic species.

Appendix C – Fauna Species List

EXPECTED FAUNA SPECIES LIST

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

The species records within the Subject Site were recorded by:

- Observed (O);
- Heard (W);
- Scat (P);
- Miscellaneous (M);
- Track/scratchings (F);
- Nest (E) and / or
- Burrow (FB).

The Bat record within the Subject Site were recorded by:

- Observed (O);
- Definitely (D);
- Possible or within Species Group (P); and
- Likely (L).

The Survey Equipment used to detect Fauna:

- Anabat (A),
- Songmeter (SM); and
- Camera Trap (CT).

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

Scientific Name	Common Name	NSW status	Comm. status	Records	Surveyed Observations	Survey Equipment
Amphibians						
Crinia signifera	Common Eastern Froglet	P		116	W	
Pseudophryne bibronii	Bibron's Toadlet	P		1		
Pseudophryne coriacea	Red-backed Toadlet	P		1		
Uperoleia fusca	Dusky Toadlet	P		1	W	
Uperoleia laevigata	Smooth Toadlet	P		6		
Uperoleia sp.		P		4		
Limnodynastes peronii	Brown-striped Frog	P		86		
Limnodynastes tasmaniensis	Spotted Grass Frog	P		51	O, W	
Litoria caerulea	Green Tree Frog	P		39	O, W	CT
Litoria dentata	Bleating Tree Frog	P		15	O, W	
Litoria fallax	Eastern Dwarf Tree Frog	P		82		
Litoria latopalmata	Broad-palmed Frog	P		14		
Litoria peronii	Peron's Tree Frog	P		107		
Litoria phyllochroa	Leaf-green Tree Frog	P		1		
Litoria tyleri	Tyler's Tree Frog	P		19		
Litoria verreauxii	Verreaux's Frog	P		19		
Reptiles						
Chelodina longicollis	Eastern Snake-necked Turtle	P		15		
Carlia tetradactyla	Southern Rainbow-skink	P		2		
Concinnia tenuis	Barred-sided Skink	P		4		
Ctenotus robustus	Robust Ctenotus	P		4		
Eulamprus quoyii	Eastern Water-skink	P		17		
Lampropholis delicata	Dark-flecked Garden Sunskink	P		25		
Lampropholis guichenoti	Pale-flecked Garden Sunskink	P		6		
Lerista stylis	Arnhem Coast Fine-lined Slider	P		6		
Tiliqua scincoides	Eastern Blue-tongue	P		70		
Amphibolurus muricatus	Jacky Lizard	P		2		
Intellagama lesueurii	Eastern Water Dragon	P		3		
Intellagama lesueurii lesueurii	Eastern Water Dragon	P		9		
Pogona barbata	Bearded Dragon	P		14		
Varanus varius	Lace Monitor	P		3		
Morelia spilota spilota	Diamond Python	P		2		
Dendrelaphis punctulatus	Common Tree Snake	P		3		
Cacophis squamulosus	Golden-crowned Snake	P		3		
Hemiaspis signata	Black-bellied Swamp Snake	P		9		
Pseudechis porphyriacus	Red-bellied Black Snake	P		83		
Pseudonaja textilis	Eastern Brown Snake	P		33		
Birds						
Coturnix pectoralis	Stubble Quail	P		4		

Scientific Name	Common Name	NSW status	Comm. status	Records	Surveyed Observations	Survey Equipment
Synoicus ypsilophora	Brown Quail	P		18		
Anas castanea	Chestnut Teal	P		423		
Anas gracilis	Grey Teal	P		369		
Anas rhynchotis	Australasian Shoveler	P		213		
Anas superciliosa	Pacific Black Duck	P		487	O	
Aythya australis	Hardhead	P		223		
Biziura lobata	Musk Duck	P		20		
Chenonetta jubata	Australian Wood Duck	P		367	O, W	CT
Cygnus atratus	Black Swan	P		338		
Dendrocygna arcuata	Wandering Whistling-Duck	P		7		
Dendrocygna eytoni	Plumed Whistling-Duck	P		4		
Malacorhynchus membranaceus	Pink-eared Duck	P		171		
Oxyura australis	Blue-billed Duck	V,P		1		
Stictonetta naevosa	Freckled Duck	V,P		26		
Tadorna tadornoides	Australian Shelduck	P		7		
Podiceps cristatus	Great Crested Grebe	P		5		
Poliocephalus poliocephalus	Hoary-headed Grebe	P		99		
Tachybaptus novaehollandiae	Australasian Grebe	P		267		
Columba livia	Rock Dove			54		
Geopelia humeralis	Bar-shouldered Dove	P		18		
Lopholaimus antarcticus	Topknot Pigeon	P		7		
Macropygia phasianella	Brown Cuckoo-Dove	P		2		
Ocyphaps lophotes	Crested Pigeon	P		372	O	
Ptilinopus magnificus	Wompoo Fruit-Dove	V,P		1	O	CT
Spilopelia chinensis	Spotted Turtle-Dove			260		
Podargus strigoides	Tawny Frogmouth	P		71	O	CT
Aegotheles cristatus	Australian Owlet-nightjar	P		3		
Anhinga novaehollandiae	Australasian Darter	P		218		
Microcarbo melanoleucos	Little Pied Cormorant	P		201		
Phalacrocorax sulcirostris	Little Black Cormorant	P		244		
Phalacrocorax varius	Pied Cormorant	P		89	O	
Pelecanus conspicillatus	Australian Pelican	P		307		
Ardea intermedia	Intermediate Egret	P		157		
Ardea pacifica	White-necked Heron	P		106		
Bubulcus ibis	Cattle Egret	P		293	O	
Casmerodius modesta	Eastern Great Egret	P		253		
Egretta garzetta	Little Egret	P		72		
Egretta novaehollandiae	White-faced Heron	P		348	O	CT
Platalea flavipes	Yellow-billed Spoonbill	P		72		

Scientific Name	Common Name	NSW status	Comm. status	Records	Surveyed Observations	Survey Equipment
Platalea regia	Royal Spoonbill	P		219		
Plegadis falcinellus	Glossy Ibis	P		29		
Threskiornis moluccus	Australian White Ibis	P		229		
Threskiornis spinicollis	Straw-necked Ibis	P		259		
Accipiter cirrocephalus	Collared Sparrowhawk	P		14		
Accipiter fasciatus	Brown Goshawk	P		22		
Accipiter novaehollandiae	Grey Goshawk	P		13		
Aquila audax	Wedge-tailed Eagle	P		23		
Aviceda subcristata	Pacific Baza	P		7		
Circus approximans	Swamp Harrier	P		170		
Elanus axillaris	Black-shouldered Kite	P		91		
Haliaeetus leucogaster	White-bellied Sea-Eagle	V,P		166	O	
Haliastur sphenurus	Whistling Kite	P		216	O	
Milvus migrans	Black Kite	P		30		
Falco berigora	Brown Falcon	P		36		
Falco cenchroides cenchroides	Nankeen Kestrel	P		108	O	CT
Falco longipennis	Australian Hobby	P		85		
Falco peregrinus	Peregrine Falcon	P		41		
Vanellus miles	Masked Lapwing	P		398	O, W	
Vanellus tricolor	Banded Lapwing	P		4		
Turnix varius	Painted Button-quail	P		4		
Chroicocephalus novaehollandiae	Silver Gull	P		50		
Cacatua galerita	Sulphur-crested Cockatoo	P		331	O, W	CT
Cacatua sanguinea	Little Corella	P		199	O, W	CT
Cacatua tenuirostris	Long-billed Corella	P		118	O, W	
Eolophus roseicapilla	Galah	P		538	O, W	
Zanda funereus	Yellow-tailed Black-Cockatoo	P		82		
Alisterus scapularis	Australian King-Parrot	P		83		
Glossopsitta concinna	Musk Lorikeet	P		21		
Platycercus elegans	Crimson Rosella	P		12		
Platycercus eximius	Eastern Rosella	P		404	O, W	
Psephotus haematonotus	Red-rumped Parrot	P		174	O, W	
Trichoglossus chlorolepidotus	Scaly-breasted Lorikeet	P		151		
Trichoglossus haematodus	Rainbow Lorikeet	P		446	O, W	
Cacomantis flabelliformis	Fan-tailed Cuckoo	P		31		
Eudynamys orientalis	Eastern Koel	P		85		
Heteroscenes pallidus	Pallid Cuckoo	P		24		
Scythrops novaehollandiae	Channel-billed Cuckoo	P		60		
Ninox novaeseelandiae	Southern Boobook	P		14	O, W	

Scientific Name	Common Name	NSW status	Comm. status	Records	Surveyed Observations	Survey Equipment
Tyto javanica	Eastern Barn Owl	P		11	O, W	CT
Ceyx azureus	Azure Kingfisher	P		9		
Dacelo novaeguineae	Laughing Kookaburra	P		223	O, W	CT
Todiramphus sanctus	Sacred Kingfisher	P		65		
Merops ornatus	Rainbow Bee-eater	P		6		
Eurystomus orientalis	Dollarbird	P		83		
Malurus cyaneus	Superb Fairy-wren	P		420	O, W	
Malurus lamberti	Variegated Fairy-wren	P		24		
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	P		95		
Acanthiza lineata	Striated Thornbill	P		15		
Acanthiza nana	Yellow Thornbill	P		77		
Acanthiza pusilla	Brown Thornbill	P		48		
Acanthiza reguloides	Buff-rumped Thornbill	P		3		
Sericornis frontalis	White-browed Scrubwren	P		25		
Pardalotus punctatus	Spotted Pardalote	P		83		
Pardalotus striatus	Striated Pardalote	P		65		
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	P		1		
Acanthorhynchus tenuirostris	Eastern Spinebill	P		28		
Anthochaera carunculata	Red Wattlebird	P		89		
Anthochaera chrysoptera	Little Wattlebird	P		15		
Caligavis chrysops	Yellow-faced Honeyeater	P		196		
Entomyzon cyanotis	Blue-faced Honeyeater	P		64		
Lichmera indistincta	Brown Honeyeater	P		10		
Manorina melanocephala	Noisy Miner	P		467	O, W	CT
Meliphaga lewinii	Lewin's Honeyeater	P		22		
Melithreptus brevirostris	Brown-headed Honeyeater	P		19		
Melithreptus lunatus	White-naped Honeyeater	P		30		
Myzomela sanguinolenta	Scarlet Honeyeater	P		59		
Philemon citreogularis	Little Friarbird	P		1		
Philemon corniculatus	Noisy Friarbird	P		47		
Phylidonyris niger	White-cheeked Honeyeater	P		20		
Phylidonyris novaehollandiae	New Holland Honeyeater	P		2		
Plectorhyncha lanceolata	Striped Honeyeater	P		12		
Ptilotula fusca	Fuscous Honeyeater	P		5		
Ptilotula penicillata	White-plumed Honeyeater	P		16		
Coracina novaehollandiae	Black-faced Cuckoo-shrike	P		320		
Coracina papuensis	White-bellied Cuckoo-shrike	P		2		
Lalage sueurii	White-winged Triller	P		20		

Scientific Name	Common Name	NSW status	Comm. status	Records	Surveyed Observations	Survey Equipment
Colluricincla harmonica	Grey Shrike-thrush	P		27		
Pachycephala pectoralis	Golden Whistler	P		70		
Pachycephala rufiventris	Rufous Whistler	P		53		
Oriolus sagittatus	Olive-backed Oriole	P		49		
Sphecotheres vieilloti	Australasian Figbird	P		67		
Artamus leucoryn	White-breasted Woodswallow	P		100		
Cracticus nigrogularis	Pied Butcherbird	P		328	O, W	CT
Cracticus torquatus	Grey Butcherbird	P		153	O, W	
Gymnorhina tibicen	Australian Magpie	P		773	O, W	CT
Strepera graculina	Pied Currawong	P		63	O, W	
Dicrurus bracteatus	Spangled Drongo	P		9		
Rhipidura albiscapa	Grey Fantail	P		177		
Rhipidura leucophrys	Willie Wagtail	P		452		
Rhipidura rufifrons	Rufous Fantail	P		18		
Corvus coronoides	Australian Raven	P		471	O, W	
Corvus orru	Torresian Crow	P		11	W	
Grallina cyanoleuca	Magpie-lark	P		655	W	
Monarcha melanopsis	Black-faced Monarch	P		3		
Myiagra cyanoleuca	Satin Flycatcher	P		1		
Myiagra rubecula	Leaden Flycatcher	P		11		
Corcorax melanorhamphos	White-winged Chough	P		18		
Eopsaltria australis	Eastern Yellow Robin	P		24		
Microeca fascinans	Jacky Winter	P		4		
Petroica rosea	Rose Robin	P		16		
Mirafra javanica	Horsfield's Bushlark	P		5		
Cisticola exilis	Golden-headed Cisticola	P		248		
Acrocephalus australis	Australian Reed-Warbler	P		220		
Cincloramphus cruralis	Brown Songlark	P		23		
Cincloramphus mathewsi	Rufous Songlark	P		23		
Cincloramphus timoriensis	Tawny Grassbird	P		64		
Poodytes gramineus	Little Grassbird	P		154		
Hirundo neoxena	Welcome Swallow	P		412		
Petrochelidon ariel	Fairy Martin	P		107		
Petrochelidon nigricans	Tree Martin	P		121		
Turdus merula	Eurasian Blackbird			11		
Acridotheres tristis	Common Myna			442	O, W	
Sturnus vulgaris	Common Starling			267		
Zosterops lateralis	Silvereye	P		104		
Dicaeum hirundinaceum	Mistletoebird	P		47		

Scientific Name	Common Name	NSW status	Comm. status	Records	Surveyed Observations	Survey Equipment
Lonchura castaneothorax	Chestnut-breasted Mannikin	P		8		
Neochmia modesta	Plum-headed Finch	P		5		
Neochmia temporalis	Red-browed Finch	P		116		
Stizoptera bichenovii	Double-barred Finch	P		4		
Taeniopygia guttata	Zebra Finch	P		3		
Passer domesticus	House Sparrow			36		
Anthus novaeseelandiae	Australian Pipit	P		155		
Mammals						
Tachyglossus aculeatus	Short-beaked Echidna	P		13		
Antechinus stuartii	Brown Antechinus	P		13		
Isoodon macrourus	Northern Brown Bandicoot	P		5		
Vombatus ursinus	Bare-nosed Wombat	P		4		
Petaurus breviceps	Sugar Glider	P		40		CT
Pseudocheirus peregrinus	Common Ringtail Possum	P		15		
Acrobates pygmaeus	Feathertail Glider	P		18		
Trichosurus vulpecula	Common Brushtail Possum	P		54		
Macropus giganteus	Eastern Grey Kangaroo	P		39		
Notamacropus rufogriseus	Red-necked Wallaby	P		13		
Wallabia bicolor	Swamp Wallaby	P		7		
Pteropus alecto	Black Flying-fox	P		4		
Pteropus poliocephalus	Grey-headed Flying-fox	V,P	V	36	O	
Austronomus australis	White-striped Freetail-bat	P		33		
Ozimops planiceps	South-eastern Free-tailed Bat	P		6		
Ozimops ridei	Eastern Free-tailed Bat	P		20		
Chalinolobus dwyeri	Large-eared Pied Bat	P, V		0	P	A
Chalinolobus gouldii	Gould's Wattled Bat	P		45		
Chalinolobus morio	Chocolate Wattled Bat	P		20		
Myotis macropus	Southern Myotis	V,P		12	P	**A**
Nyctophilus geoffroyi	Lesser Long-eared Bat	P		11		
Nyctophilus gouldi	Gould's Long-eared Bat	P		6		
Nyctophilus sp.	long-eared bat	P		16	P	A
Scotorepens orion	Eastern Broad-nosed Bat	P		16		
Vespadelus darlingtoni	Large Forest Bat	P		2		
Vespadelus pumilus	Eastern Forest Bat	P		6	P	A
Vespadelus regulus	Southern Forest Bat	P		2		
Vespadelus troughtoni	Eastern Cave Bat	V,P		1	P	A
Vespadelus vulturnus	Little Forest Bat	P		34	**P**	**A**
Hydromys chrysogaster	Water-rat	P		1		
Rattus lutreolus	Swamp Rat	P		1		

Scientific Name	Common Name	NSW status	Comm. status	Records	Surveyed Observations	Survey Equipment
Canis familiaris	Dog			5		
Canis lupus	Dingo, domestic dog			7		
Vulpes vulpes	Fox			72		
Lepus capensis occidentalis	Brown Hare			20		
Oryctolagus cuniculus	Rabbit			18	P, O	
Equus caballus	Horse			4	O	
Bos taurus	European cattle			5	O	
Ovis aries	Sheep (feral)			1		

Appendix D – BAM Plot Data

Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Apiaceae	*Centella asiatica*	Swamp Pennywort	Forb			0.3		0.2
Asteraceae	*Euchiton spp.*	A Cudweed	Forb		0.1	0.1		
Asteraceae	*Gamochaeta purpurea*		nil - exotic					0.5
Asteraceae	*Hypochaeris radicata**	Flatweed	nil - exotic	0.3	0.2	1	0.1	0.3
Asteraceae	*Pseudognaphalium luteoalbum*	Cudweed	Forb				0.1	
Asteraceae	*Senecio madagascariensis**	Fireweed	nil - exotic	30	0.1	1	0.5	1
Asteraceae	*Soliva sessilis**	Bindii	nil - exotic	0.2	0.5	0.1	0.1	
Asteraceae	*Epaltes australis*	Spreading Nut-heads	Forb					0.3
Commelinaceae	*Commelina cyanea*	Scurvy Weed, Native Wandering Jew				Forb		0.2
Cyperaceae	*Cyperus tenellus**		nil - exotic			0.1		
Cyperaceae	*Schoenus apogon*	Fluke Bog-rush	Sedge		0.1			
Fabaceae	*Trifolium campestre**	Hop Clover	nil - exotic			0.1		
Fabaceae	*Trifolium repens**	White Clover	nil - exotic	15	0.1	0.1	0.5	0.1
Gentianaceae	*Centaurium erythraea**	Common Centaury	nil - exotic					0.1
Geraniaceae	*Erodium spp.**	Crowfoot	nil - exotic				0.1	
Goodeniaceae	*Velleia paradoxa*							0.2
Iridaceae	*Romulea rosea**		nil - exotic	2				
Juncaceae	*Juncus cognatus**		nil - exotic					0.5
Juncaceae	*Juncus spp.*		Rush	0.2				
Juncaceae	*Juncus usitatus*	Common Rush	Rush		1	0.3	0.2	
Lobeliaceae	*Lobelia purpurascens*	Whiteroot	Forb		0.3	1		0.1
Lomandraceae	*Lomandra filiformis*	Wattle Matt-rush	Rush		0.3	0.1		
Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush	Rush					0.4
Lythraceae	*Lythrum hyssopifolia*	Loosestrife	Forb					0.1
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne	nil - exotic	0.1				

Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Myrtaceae	*Corymbia maculata*	Spotted Gum	Tree		40	25	20	25
Myrtaceae	*Eucalyptus fibrosa*	Broad Leaved Ironbark	Tree		20	5		
Oxalidaceae	*Oxalis perennans*	Yellow-flowered Wood Sorrel	Forb	0.2	0.1	0.1	0.1	
Pittosporaceae	*Bursaria spinosa*	Native Blackthorn	Shrub		0.1			0.3
Plantaginaceae	*Plantago lanceolata**	Ribwort	nil - exotic	1	0.5	0.2	0.2	0.3
Poaceae	*Aristida vagans*	Three-awn Speargrass	Tussock Grass					2
Poaceae	*Briza minor**	Shivery Grass	nil - exotic	0.1		0.2	0.1	0.2
Poaceae	*Cenchrus clandestinum**	Kikuyu	nil - exotic	3	1	0.2		
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass	Tussock Grass					3
Poaceae	*Entolasia stricta*	Wiry Panic	Tussock Grass		0.2	0.1		1
Poaceae	*Eragrostis brownii*	Brown's Lovegrass	Tussock Grass					3
Poaceae	*Lachnagrostis filiformis*	Blown Grass	Tussock Grass			0.1		2
Poaceae	*Lolium perrenne**	Perennial Ryegrass	nil - exotic	1	0.1	0.2	0.2	0.1
Poaceae	*Microlaena stipoides*	Weeping Grass	Other Grass					0.5
Poaceae	*Paspalidium distans*		Tussock Grass					0.2
Poaceae	*Paspalum dilatatum**	Paspalum	nil - exotic					4
Poaceae	*Poa annua**	Winter Grass	nil - exotic	0.5	0.1			
Poaceae	*Rytidosperma fulvum*	Wallaby Grass	Tussock Grass					2
Poaceae	*Sporobolus africanus**	Parramatta Grass	nil - exotic					0.5
Poaceae	*Vulpia myuros**	Rat's Tail Fescue	nil - exotic					0.5
Poaceae	*Dichelachne micrantha*							3
Polygonaceae	*Persicaria lapathifolia*	Pale Knotweed	Forb					0.2
Polygonaceae	*Rumex crispus**	Curled Dock	nil - exotic					0.1
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel	nil - exotic		0.2		0.1	
Solanaceae	*Solanum nigrum**	Black Nightshade, Black-berry Nightshade				nil - exotic		

Family	Scientific Name	Common Name	BAM Growth Form	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Solanaceae	*Solanum spp.**		nil - exotic				0.1	
Verbenaceae	*Verbena bonariensis**	Purpletop	nil - exotic					0.1

Appendix E – Biodiversity Credit Report

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00036606/BAAS19076/22/00036607

Proposal Name
1633 Berry Park

BAM data last updated *
14/04/2023

Assessor Name
Natalie S Black

Assessor Number
BAAS19076

BAM Data version *
58

Proponent Names

Report Created
06/06/2023

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Part 4 Developments (General)

Date Finalised
06/06/2023

BOS entry trigger
BOS Threshold: Area clearing threshold

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

Potential Serious and Irreversible Impacts

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

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo
Dasyurus maculatus / Spotted-tailed Quoll
Grantiella picta / Painted Honeyeater
Anthochaera phrygia / Regent Honeyeater

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	6.0	89	0	89

BAM Biodiversity Credit Report (Like for like)

1600-Spotted Gum - Red Ironbark - Narrow-leaved Ironbark - Grey Box shrub-grass open forest of the lower Hunter	**Like-for-like credit retirement options**					
	Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions This includes PCT's: 1590, 1592, 1593, 1600, 1602, 3433, 3442, 3443, 3444	-	1600_Degraded	Yes	89	Hunter, Ellerston, Karuah Manning, Kerrabee, Liverpool Range, Peel, Tomalla, Upper Hunter, Wyong and Yengo. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Myotis macropus / Southern Myotis	**1600_Degraded**	3.9	58.00

Credit Retirement Options

Like-for-like credit retirement options

Myotis macropus / Southern Myotis	Spp	IBRA subregion
	Myotis macropus / Southern Myotis	Any in NSW

Appendix F – Site Photographs

Above: BAM plot 5 on site facing South

Below: BAM plot 5 on site facing East

Above: Dam located on site

Below: Little Corella observed on site

Above: Barn Owl identified on site

Below: Dam located on site

Above: Tree frog observed on site.

Below: Southern Boobook (*Ninox boobook*) observed on site

Appendix G – Other Legislation

EPBC Act Assessment

A Protected Matters Search of an area of 5km radius of the Study Area was conducted in September 2022 for Matters of National Environmental Significance as relevant to the Environment Protection & Biodiversity Conservation Act 1999 (EPBC Act). The following Matters of National Significance are considered in this assessment.

World Heritage Properties:

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

National Heritage Places:

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

Wetlands of International Significance (declared Ramsar wetlands):

The site is not part of, or within close proximity to a Wetland 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:

From a search of the EPBC Act Protected Matters website (10/11/2022), five (5) listed Threatened Ecological Communities (TECs) were considered likely to occur within a 5km radius of the Study Area.

Three (3) Critically Endangered Ecological Communities;

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

Two (2) Endangered Ecological Communities:

- Coastal Swamp oak (Casuarina glauca) Forest of New South Wales and South East Queensland ecological community
- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland

Ground-truthing during field surveys found that PCT 1600 – Spotted Gum – Red Ironbark – Narrow-leaved Ironbark – Grey Box Shrub-grass open forest of the lower hunter, which is present on site, is associated with the EPBC Act listed EEC; Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions and Central Hunter Ironbark, Spotted Gum, Grey Box Forest in the NSW North Coast and Sydney Basin Bioregions.

Assessing the community against the Scientific determination revealed that the community onsite does not contain a predominantly native understory and is highly disturbed with some areas containing a high coverage of exotic grasses. Additionally, it is considered that areas in which an overstorey exists without a substantially native understorey are degraded and are no longer a viable part of the ecological community. As such it is considered that PCT 1600 present on site is

considered to be too degraded to be considered commensurate with the EEC and no further assessment is required.

Given the above the vegetation communities present on site are not commensurate with any of the aforementioned Threatened Ecological Communities and no further assessment is required.

Threatened Species:

Threatened species listed under the EPBC Act considered 47 species likely to occur on site, which were assessed from field inspections/surveys, Bird Data and using the BioNet Atlas search tool within a 10km search radius to the Study Area with most recent records assessed, no threatened species were identified within the Subject Site.

Migratory Species:

18 EPBC listed migratory species have the potential to utilise the site on an irregular basis. The limited number and sporadic nature of records close to the Study Area appear to reflect opportunistic rather than regular use of any habitat considered of importance to any threatened species.

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

EPBC Act Assessment Conclusion:

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

Water Management Act 2000

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

One (1) manmade farm dam was recorded within the project area. The site is located within proximity to Four Mile Creek and beyond the north-western boundary is mapped as a floodplain. To ensure compliance with the existing natural flooding patterns in the region, the development footprint has been carefully established, with the flood line serving as the delineating boundary.

Fisheries Management Act 1994

One (1) man-made dam is mapped within the site. Four Mile Creek occurs to the north west of the site and the surrounding area consists of floodplain. No natural streams or waterways are to be impacted by this development, no further assessment under the *Fisheries Management Act 1994* is required.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

The Biodiversity and Conservation SEPP commenced on 1 March 2022. This SEPP consolidated 11 other SEPPs within this SEPP on the 1 March 2022. The State Environment Planning Policy (Koala Habitat Protection) 2021 (BC SEPP) was one SEPP that was consolidated within the Biodiversity and Conservation SEPP 2021 under Chapter 4 – Koala Habitat Protection 2021. No policy changes were made as part of the consolidation nor did the legal effect of the existing SEPPs, with section 30A of the *Interpretation Act 1987* applying to the transferred provisions. The consolidation was undertaken in accordance with section 3.22 of the *Environmental Planning and Assessment Act 1979*.

The Biodiversity and Conservation 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.

The land which comprises the Study Area has no approved koala plan of management. According to the BC SEPP 2021, the policy applies if:

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

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

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

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

(5) However, despite subclauses (3) and (4), the council may grant development consent if the applicant provides to the council –

(a) information, prepared by a suitably qualified and experienced person, the council is satisfied demonstrates that the land subject of the development application –

i. does not include any trees belonging to the koala use tree species listed in Schedule 2 for the relevant koala management area, or

ii. is not core koala habitat,

Site inspections identified that the Subject Site contains koala use tree species listed in Schedule 2, including *Corymbia maculata* and *Eucalyptus fibrosa*.

In regards to identifying core koala habitat, core koala habitat is defined as;

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

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

Koala Investigation Results

As important koala trees were identified on site additional assessments were undertaken to determine if koalas were present and to determine if the site was core koala habitat as per the definitions above.

Survey effort for Koalas included:

- Spot Assessment Technique
- Nocturnal spotlighting searches and call playback (27/08/22-28/02/22, 27/09/2022, 23/11/2022)
- Koala SAT survey (24/11/2022)
- Camera trapping and Songmeter (9/11/2022 – 7/12/2022)

Targeted surveys failed to identify any sign of koala utilisation of the site. Desktop assessment of local records show that koala records in the area are sparse with only two records within 10km. One recent record approx. 2.9km to the north east in Hinton from 2020 is unlikely to be associated with the Subject Site given its separation from the Subject Site by the Hunter River. The second record from 2002 is located approx. 6km to the southeast. Given the details of these sightings the site is unlikely to be Core Koala Habitat, however, taking the precautionary approach a Tier 2 Assessment has been undertaken.

Tier 2 Assessment

Part A: Presence of highly suitable Koala Habitat

Determine the PCT (using suitable methods) and if PCT have Schedule 2 listed trees an assessment must be undertaken to determine koala presence.

The entirety of the Subject Area comprises 30.12ha, therefore, the BC SEPP applies. Native canopy is present within the Subject Site, containing trees listed under Schedule 2 of the SEPP. Therefore, the site is deemed to be Highly Suitable Koala Habitat and a Tier two assessment is required and targeted Koala surveys were undertaken on site.

Assess BioNet for records - All records within set distance (2.5km OR 5km) in the last 18 years apply. = Core Habitat. Requiring a Part B Assessment to determine koala presence.

An assessment of BioNet showed one (1) record within 5km from the Study Area within the last 18 years;

- One (1) record from 2020 occurs 2.9km north of the Subject Site, north of the Hunter River, the Hunter River is considered a natural barrier for this species.

Part B Assessment

i) Koala Presence – Spot Assessment Technique, Nocturnal Survey and Call Playback

AEP undertook Scat Assessment Technique (SAT) (Phillips and Callaghan 2011), Nocturnal and camera trap Koala surveys during August, September, November and December 2022.

Two (2) Koala SAT surveys were undertaken in locations where Potential Koala Habitat (PKH) was present. No Koala scats or tree scratch marks were found during a search at the base of sixty (60) 'koala use trees' listed in Schedule 2 of SEPP 2021, within the Subject Site.

Songmeters, call playback and nocturnal searches was utilised as part of the site assessment. Infrared camera traps were used to detect the presence of nocturnal mammals within the site.

Surveys failed to detect Koalas or evidence of Koala use within the Subject Site.

ii) Koala Records

As stated above, one (1) BioNet records occurs within 5km from the Study Area within the last 18 years.

Records within these maximum distances must only be considered after a careful examination of the broader landscape. That is, within areas of contiguous habitat or between areas of habitat with connectivity. For example, a record from 2.5km from the Subject Site must not be used if natural or artificial landscape features would prevent koalas from the area with the record ever moving to the site (e.g. due to large rivers, roads, fences or built up areas).

Koala Assessment

Principles	Criteria	Assessment
Introduction	Describe the nature of the proposed development.	Proposed residential subdivision and associated civil works.
	Define how the SEPP applies to the proposed development.	Refer above to Tier 1 and Tier 2 Assessment.
Koala habitat values – addressing criteria 1 and 2	Describe the site area, including the general environment and condition, location and extent of the development area and any other areas that may be directly or indirectly impacted by the proposed development.	Multiple lots, primarily within 24 Duckenfield Road, Berry Park comprises approx. 42.6 of native vegetation and cleared areas. Development would impact approx. 5.95ha of highly degraded native vegetation. The proposal has been designed to avoid or mitigate as many impacts to biodiversity as possible under the Avoid and Minimise principle as set out in BAM 2020.
	Provide details of koala survey as undertaken in accordance with Appendix C. This should include details of the results of the koala surveys, including how the site area meets the definition of core koala habitat and mapping that shows habitat areas and koala records within the site area and adjoining areas.	Two SATs and nocturnal spotlighting surveys were undertaken in August, September and November 2022. No evidence of koala was detected within the Subject Site. Figure 4 shows vegetation commensurate with Core Koala Habitat.
	Describe the site context (including mapping showing habitat that might be associated with vegetation in the adjoining landscape and records within the vicinity of the site area) and provide an analysis of the koala habitat values (including how koalas might use the site area and the relative importance of the site area to a local koala population).	Vegetation within the Subject Site have Schedule 2 listed tree species, as confirmed by field surveys. Ground truthing of the vegetation on site revealed remnant vegetation within the Subject Site to be commensurate with PCT 1600. Given that surveys failed to find any sign of Koala and Koala records are scarce it is considered that Koala presence within the site is highly unlikely and the wider areas is unlikely to support a local population.
Measures taken to avoid impacts to koalas –	Describe the site selection process, including how koala habitat was taken into account and any avoidance	Targeted surveys failed to identify any sign of koala utilisation of the site. As it was determined that it is

Principles	Criteria	Assessment
addressing criteria 3, 4, 5, 6, 7 and 8	outcomes achieved through this process.	unlikely that Koalas are present within the Subject Site it has been deemed that the site does not constitute Core Koala Habitat and hence no further assessment is required.
	Describe how the proposed development avoids or minimises direct impacts to koala habitat and habitat function within the site area.	The avoid and minimise process has been undertaken – locating the development on lands predominately disturbed and under scrubbed. Given it is highly likely that there is no koala population present no further action was considered necessary.
Analysis of potential impacts – addressing criteria 9	Identify the residual direct impacts to koalas and koala habitat within the site area, including the nature and extent of impacts and the likely implications for the viability of a local koala population.	Not Applicable as no local koala population is likely to be present.
	Identify the relevant potential indirect impacts to koalas and koala habitat within the site area and adjacent habitat areas, including the nature and extent of potential indirect impacts and the likely implications for the viability of a local koala population.	Not Applicable as no local koala population is likely to be present.
Plan to manage and protect koalas and their habitat – addressing criteria 10, 11, 12 and 13	Describe the management measures that will be implemented as part of proposed construction and operations to manage the direct and indirect impacts identified. These measures should be outcomes focussed and include performance targets.	Not Applicable as no local koala population is likely to be present.
	Describe any compensatory measures that will be delivered, including an analysis of the suitability of these measures against criteria 9 and 10.	No specific koala offsets required because of the lack of a koala population that could utilise the site.
	Outline a plan for monitoring, adaptive management and reporting against the key outcomes and performance targets.	Not Applicable as no local koala population is likely to be present

Appendix H – White-bellied Sea-Eagle nest Final Report

STEPHEN DEBUS BA, Dip Natural Resources (Wildlife), Dip Ed, MSc (Zoology), PhD (Zool.)

ECOLOGIST

PO Box 1015 Armidale NSW 2350
Tel 02 6773 2510 bh, 02 6772 1710 ah
0409 779 766 mobile
E-mail sdebus@une.edu.au
Website www.une.edu.au/staff/sdebus.php
ABN 36 753 055 798

- Fauna surveys
- Ecology of birds
- Impact assessment
- Review & editorial
- Bibliographical

White-bellied Sea-Eagle nest, Chisholm: Final Report

Background

I was engaged by Avid Properties to investigate the existing nest structures of the White-bellied Sea-Eagle and advise on any impacts of proposed construction activity on the eagle, at the proposed residential development at McFarlanes Road and Dragonfly Drive, 'Waterford', Chisholm, NSW. Specifically, I was asked to consider whether the original eagle nest and tree, situated within the proposed development footprint, could be removed without significantly endangering the eagle. Facts established as at May 2022, on the basis of field investigations by Anderson Environment & Planning (AEP) and on-site and aerial imagery, were that:

1. The old nest (#1) in the dead tree is an abandoned White-bellied Sea-Eagle nest that has not and will not be re-used, as Sea-Eagles prefer the cover provided by the canopy of a living nest-tree. This nest was a traditional site said to have been used for about 30 years, and to have been abandoned before 2018 after development encroached to about 80 m from the tree.
2. The newer nest (#2) in the large living Spotted Gum was built by and had been occupied by a pair of Sea-Eagles since 2018, with one eagle or the pair photographed on the nest in 2018 and 2020 and reported to have bred in that nest in 2021. This nest was, at May 2022, about 100 m from the development front.
3. The eagles were not observed by AEP ecologists at nest structure #2 through May 2022, dates on which nest renovation and vocalisations by the eagle pair could be expected if they were going to use the nest in 2022. This nest was not renovated in 2022.
4. AEP discovered a new Sea-Eagle nest (structure #3) being built by the eagles on the bank of Four Mile Creek, more than 250 m from the edge of the proposed development footprint, although within 500 m of the proposed ultimate development footprint.

The lack of activity at nest tree #2 in May 2022, and the concurrent discovery of a new nest (#3) being built, indicated that the eagles would not use nest #2 in 2022 and intended to use nest #3. Although Sea-Eagles can have alternative nests which they may use in alternate years, a new nest (in this case #3) typically means that a previous nest (in this case #2) is unlikely to be reused. It is likely that the eagles chose to move to a new nest site (#3) because they were uncomfortable with the development front

being only 100 m from nest #2, and the disturbance associated with existing development is likely to discourage them from reusing nest #2 in the future.

There are precedents for Sea-Eagle pairs being able to build a new nest at a new site, after removal of an existing nest tree at an appropriate (non-sensitive) time, if there is suitable alternative nesting habitat available within their territory. That scenario applied to the current proposal in the 2022 nesting season. In light of the above considerations, removal of nest #2 outside the breeding season is unlikely to significantly endanger the eagles or their breeding attempts. The eagles now have an alternative nest site (#3) which, being in a riparian zone, would have some degree of statutory protection.

Field inspection

I visited the subject eagle nest area for 2 hours on the late afternoon to sunset of 27 June 2022, and on the following morning 28 June for approximately 1 hour. Based on the AEP inspections and my understanding of the White-bellied Sea-Eagle, I can confirm that:

- Nest structure #1 is long abandoned. The eagles are highly unlikely to return to this nest, given that the supporting tree is dead.
- Nest structure #2 was falling into disrepair and showed no reoccupation or rebuilding. Given the proximity of development, and the timing, it is considered highly unlikely that the White-bellied Sea-Eagles will ever return to this nest.

Given these circumstances, construction works within 250 m of Nests 1 and 2 are highly likely to have no impact on the eagles, as these nest structures are no longer important resources for the eagles.

Further monitoring

Ongoing monitoring by AEP personnel established that the pair of Sea-Eagles had eggs in nest #3 in 2022, and proceeded to rear two young to successful fledging by early December 2022 (photographic evidence reviewed by me). This outcome means that nest #3 is functioning as a successful substitute nest for the old and abandoned nest structures #1 and #2. The location of nest #3, remote from construction activity, means that the eagles' future nesting activities at nest #3 are unlikely to be disturbed by further construction work for the proposed development.

The concept of viewsheds

The Threatened Biodiversity Data Collect document for a Biodiversity Assessment Report includes the concept of viewsheds from the nest of a threatened raptor. A viewshed refers to the landscape view a raptor can see from the nest, out to defined distance limits in specified directions. A maximum viewshed of 1000 m from development activities is specified for the White-bellied Sea-Eagle, such that if development activities within up to 1000 m are visible from the nest then a disturbance-free buffer of that radius should be applied for the duration of the breeding season. In the present context at Chisholm a viewshed buffer of 1000 m in

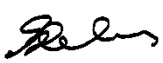
the breeding season is impractical, unrealistic and unachievable, as the birds have already shown themselves tolerant of, and capable of breeding successfully within, a viewshed to existing development and concurrent construction activities of less than 300 m.

Conclusions and recommendations

Nest #3 is more than 250 m, and thus beyond the DPIE/EES recommended buffer radius, from the proposed development footprint, and therefore the eagles, and nesting attempts in structure #3, are unlikely to be disturbed by the development proposal. It is noted that the 250-m buffer is applicable to peri-urban areas where eagles would be habituated to human presence and development, as in the present case, whereas 500 m is applicable to more remote locations where eagles have less contact with people and urban development. Similarly, the 1000 m viewshed buffer was based on remote areas where the eagles nest on cliffs and human disturbance is from above, on the cliff top.

The eagles' use of nest structure #3 means that any Council conditions relating to structure #2 can be relaxed, as structure #2 will not be used again. Instead, conditions on works in the vicinity of structure #3 could be imposed, such as: (i) restricting construction activities to outside a radius of 250 m from the nest, and (ii) performing potentially disturbing construction activity (road batters) at the closest point to nest #3 during the period outside the eagles' breeding season, as far as practicable. The breeding season is May to December, enabling a construction window of January to April for road batters closest to the nest.

Greater confidence in the security of nest #3 could be realised by a greater level of protection, if possible, for the area in which nest #3 is located, which is flood-prone land.



Stephen Debus

16 December 2022

Appendix I – Bat Analysis Report

ECOLOGY | OFFSETS | BUSHFIRE | ARBORICULTURE

AEP Internal Bat Call Summary Report

Address: 24 Duckenfield Road, Berry Park, NSW

Date: 28 February 2023

AEP ref: 1633.08

1.0 Method

Analysis of bat echolocation calls was undertaken using Anabat Insight software. Identification was carried out utilising Bat call guides developed for NSW by Pennay et al. (2004) and for North NSW and Queensland by Reinhold et al. (2001).

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

All calls were viewed, with *Vespadelus troughtoni, Chalinolobus dwyeri* and *Myotis macropus* calls targeted and identified. Calls that were too short (three pulses or less) were not analysed and tagged as unknown.

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

Table 1: Confidence ratings of bat call sequences

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

2.0 Differentiation of species with similar calls

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

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

Table 2: Call characteristics used to differentiate species

Species	Characteristic
Vespadelus troughtoni / Vespadelus vulturnus / Vespadelus pumilus	It is not currently possible to differentiate between *V.vulturnus* and *V.troughtoni* on call characteristics alone. *V.pumilus* can be differentiated only when call frequency is above 54khz.
Chalinolobus dwyeri	Differentiated from other species by frequency and presence of curved alternating calls.
Myotis macropus/ Nyctophilus spp.	*M.macropus* differentiated based on calls with initial slope >400 OPS and pulse intervals <75ms. Secondary characters used include central kink and slope variances between pulses. Requires high quality calls and is not always reliable.

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

3.0 Results

61 call sequences were recorded of which 28 were analysable (not short calls or noise files). Of the species that were targeted during analysis *Myotis macropus* species complex, *Vespadelus troughtoni* species complex and *Chalinolobus dwyeri* calls were not recorded.

Other bat species were present on site, however, as these species were not being targeted during this analysis, while analysed, they were not identified to species.

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

Appendix J – BDAR Checklist

Stage 1 Checklist

BAM Reference	Information	BDAR Section	Completed
Report			
Introduction - Chapters 2 and 3	Introduction to the biodiversity assessment including: ● brief description of the proposal ● identification of subject land boundary, including: - operational footprint (if BDAR) - construction footprint indicating clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR) - land proposed for biodiversity certification (if BCAR) ● general description of the subject land ● sources of information used in the assessment, including reports and spatial data	1.1 Introduction 1.1.2 Assessment Scope 1.1.3 The Proposal 1.1.5 Site Particulars 1.1.6 Information Sources Figure 1 Site Map Figure 2 Location Map Appendix A Development Plan Appendix G Other Legislation	Yes
Landscape - Section 3.1, 3.2 and Appendix E	Identification of site context components and landscape features, including; General description of subject land topographic and hydrological setting, geology and soils	1.2 Landscape Features Figure 2 – Location Map	Yes
	Percent native vegetation cover in the assessment area (as described in BAM Subsection 3.2).	1.3.2 Landscape Native Vegetation Cover	Yes
	IBRA bioregions and subregions (as described in BAM Subsection 3.1.3(2.))	1.2.1 Regional Landscapes	Yes
	Identified Landscape Features classified according to stream order (as described in BAM Subsection 3.1.3(3.) and Appendix E)	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	Identified Landscape Features within, adjacent to and downstream of the site (as described in BAM Subsection 3.1.3(3.))	1.2.2 Identified Landscape Features Appendix G Other Legislation Table 2 Landscape Feature Assessment	Yes
	Connectivity of different areas of habitat (as described in BAM Subsection 3.1.3(5–6.))	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	Karst, caves, crevices, cliffs, rocks and other geological features of significance and for vegetation clearing proposals, soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(12.)	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	Areas of geological significance and soil hazard features (as described in BAM Subsections 3.1.3(7.) and 3.1.3(8-9.))	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	Any additional landscape features identified in any SEARs for the proposal	1.2.2 Identified Landscape Features Table 2 Landscape Feature Assessment	Yes
	NSW (Mitchell) landscape on which the subject land occurs	1.2.1 Regional Landscapes	Yes

BAM Reference	Information	BDAR Section	Completed
Native vegetation, Chapter 4, Appendix A and Appendix H	Identify native vegetation extent within the subject land, including cleared areas and evidence to support differences between mapped vegetation extent and aerial imagery (as described in BAM Section 4.1(1–3.) and Subsection 4.1.1)	1.4 Native Vegetation Figure 3 Regional Vegetation Mapping Appendix F Site Photographs	Yes
	Provide justification for all parts of the subject land that do not contain native vegetation (as described in BAM Subsection 4.1.2)	1.4 Native Vegetation 1.4.3 PCT Selection Justification Appendix F Site Photographs	Yes
	Review of existing information on native vegetation including references to previous vegetation maps of the subject land and assessment area (described in BAM Section 4.1(3.) and Subsection 4.1.1)	1.4.1 Regional Mapping 1.5 Threatened Species Appendix B Flora Species List	Yes
	Describe the systematic field-based floristic vegetation survey undertaken in accordance with BAM Section 4.2	1.4.1 Regional Mapping 1.4.2 Plot Based Floristic Surveys 1.4.3 PCT Selection Justification Figures 6 - Survey Effort 1.4.5 Vegetation Integrity Score 1.5.3 Field Survey Methods Appendix D BAM Field Sheets Appendix F Site Photographs	Yes
	Where relevant, describe the use of more appropriate local data, provide reasons that support the use of more appropriate local data and include the written confirmation from the decision-maker that they support the use of more appropriate local data (as described in BAM Subsection 1.4.2 and Appendix A)	N/A	Yes
	For each PCT within the subject land, describe: ● vegetation class ● extent (ha) within subject land ● evidence used to identify a PCT including any analyses undertaken, references/sources, existing vegetation maps (BAM Section 4.2(1–3.)) ● plant species relied upon for identification of the PCT and relative abundance of each species ● if relevant, TEC status including evidence used to determine vegetation is the TEC (BAM Subsection 4.2.2(1–2.)) ● estimate of percent cleared value of PCT (BAM Subsection 4.2.1(5.))	1.4 Native Vegetation 1.4.3 PCT Selection Justification Figure 3 Regional Vegetation Mapping Table 4 – Species Data for Potential PCT Determination Table 4 & 5 PCT Determination Appendix G – Other Legislation	Yes
	Describe the vegetation integrity assessment of the subject land, including: ● identification and mapping of vegetation zones (as described in BAM Subsection 4.3.1)	1.4 Native Vegetation 1.4.2 Regional Mapping 1.4.2 Plot Based Floristic Surveys 1.4.5 Vegetation Integrity Assessment	Yes

BAM Reference	Information	BDAR Section	Completed
	• assessment of patch size (as described in BAM Subsection 4.3.2) • survey effort (i.e. number of vegetation integrity survey plots) as described in BAM Subsection 4.3.4(1–2.) • use of relevant benchmark data from BioNet Vegetation Classification (as described in BAM Subsection 4.3.3(5.))	1.4.6 Vegetation Integrity Score Table 9 Summary of Vegetation Zones Areas Table 10 – VIS for PCT 1600 – Severely Degraded & Degraded 1.5.3 Field Survey Methods Figure 3 Regional Vegetation Mapping Figure 4 Ground-Truthed Vegetation Map Figure 6 Survey Effort Maps	
	Where use of more appropriate local benchmark data is proposed (as described in BAM Subsection 1.4.2, BAM Subsection 4.3.3(5.) and BAM Appendix A): • identify the PCT or vegetation class for which local benchmark data will be applied • identify published sources of local benchmark data (if benchmarks obtained from published sources) • describe methods of local benchmark data collection (if reference plots used to determine local benchmark data) • provide justification for use of local data rather than BioNet Vegetation Classification benchmark values • provide written confirmation from the decision-maker that they support the use of local benchmark data	N/A	
Threatened Species, Chapter 5	Identify ecosystem credit species likely to occur on the subject land, including: • list of ecosystem credit species derived from the BAM-C (as described in BAM Subsection 5.1.1 and Section 5.2(1.)) • justification and supporting evidence for exclusion of any ecosystem credit species based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2) • justification for addition of any ecosystem credit species to the list	1.5 Threatened Species 1.5.3 Field Survey Methods 1.5.1 Ecosystem Credit Species 1.5.2 Species Credit Species 1.6.5 Species Credit Species Survey Results Table 11 Predicted Ecosystem Credit Species Table 12 Potential Species Credit Species Appendix E Biodiversity Credit Report	Yes
	Identify species credit species likely to occur on the subject land, including: • list of species credit species derived from the BAM-C (as described in BAM Subsection 5.1.1) • justification and supporting evidence for exclusions based on geographic limitations, habitat constraints or vagrancy (as described in BAM Subsections 5.2.1 and 5.2.2)	1.5.3 Field Survey Methods 1.5.1 Ecosystem Credit Species 1.5.2 Species Credit Species Table 11 Predicted Ecosystem Credit Species Table 12 Potential Species Credit Species 1.5.4 Survey Effort Results Table 16 Species Credit Species	Yes

BAM Reference	Information	BDAR Section	Completed
	• justification and supporting evidence for exclusions based on degraded habitat constraints and/or microhabitats on which the species depends (as described in BAM Subsection 5.2.2) • justification for addition of any species credit species to the list	Figure 5 AEP BioNet Search Records Appendix C Fauna Species List	
	From the list of candidate species credit species, identify: • species assumed present within the subject land (if relevant) (as described in BAM Subsection 5.2.4(2.a.)) • species present within the subject land on the basis of being identified on an important habitat map for a species (as described in BAM Subsection 5.2.4(2.d.)) • species for which targeted surveys are to be completed to determine species presence (Subsection 5.2.4(2.b.)) • species for which an expert report is to be used to determine species presence (Subsection 5.2.4(2.c.))	Table 4 & 5 PCT Determination Tables 1.5.3 Field Survey Methods 1.5.4 Survey Effort Results Table 11 Predicted Ecosystem Credit Species EPBC Act Assessment recorded within the Subject Site – Appendix G Other Legislation Table 16 Species Credit Species Koalas – Appendix G Other Legislation Appendix I – White-bellied Sea Eagle nest Final Report	Yes
	Present the outcomes of species credit species assessments from: • threatened species survey (as described in BAM Section 5.2.4) • expert reports (if relevant) including justification for presence of the species and information used to make this determination (as described in BAM Section 5.2.4 and 5.3, Box 3)	Table 16 Species Credit Species Figure 6 Survey Effort Appendix B Flora Species List Appendix C Fauna Species List Appendix E Biodiversity Credit Report Appendix F Site Photographs	Yes
	Where survey has been undertaken include detailed information on: • survey method and effort, (as described in BAM Section 5.3) • justification of survey method and effort (e.g. citation of peer-reviewed literature) if approach differs from the Department's taxa-specific survey guides or where no relevant guideline has been published • timing of survey in relation to requirements in the TBDC or the Department's taxa-specific survey guides. Where survey was undertaken outside these guides include justification for the timing of surveys • survey personnel and relevant experience • describe any limitations to surveys and how these were addressed/overcome	1.5.3 Field Survey Methods 1.6.1 Survey Effort Results Table 16 Species Credit Species Figure 6 Survey Effort Appendix D BAM Plot Data Appendix J CVs	Yes
	Where an expert report has been used in place of survey (as described in BAM Section 5.3, Box 3), include: • justification of the use of an expert report • identify the expert, provide evidence of their expert credentials and Departmental approval of expert status	N/A	

BAM Reference	Information	BDAR Section	Completed
	● all requirements of Box 3 have been addressed in the expert report		
	Where use of local data is proposed (BAM Subsection 1.4.2): ● identify relevant species ● identify data to be amended ● identify source of information for local data, e.g. published literature, additional survey data, etc. ● justify use of local data in preference to VIS Classification or TBDC data ● provide written confirmation from the decision-maker that they support the use of local data	N/A	
	Species polygon completed for species credit species present within the subject land (assumed present or determined on the basis of survey, expert report or important habitat map) ensuring that: ● the unit of measure for each species is documented for species assessed by area: ● the polygon includes the extent of suitable habitat for the target species within the subject land (as described in BAM Subsection 5.2.5) ● a description of, and evidence-based justification for, the habitat constraints, features or microhabitats used to map the species polygon including reference to information in the TBDC for that species and any buffers applied for species assessed by counts of individuals: ● the number of individual plants present on the subject land (as described in BAM Subsection 5.2.5(3.)) ● the method used to derive this number (i.e. threatened species survey or expert report) and evidence-based justification for the approach taken ● the polygon includes all individuals located on the subject land with a buffer of 30 m around the individuals or groups of individuals on the subject land Identify the biodiversity risk weighting for each species credit species identified as present within the subject land (as described in BAM Section 5.4)	2.4.5.2 Species Credits Figure 8 – *Myotis Macropus* Species Polygon	Yes
Prescribed impacts - Chapter 6	Identify potential prescribed biodiversity impacts on threatened entities, including: ● karst, caves, crevices, cliffs, rocks and other geological features of significance (as described in BAM Subsection 6.1.1)	1.2.2 Identified Landscape Features 2.2 Impact Avoidance Measures	Yes

BAM Reference	Information	BDAR Section	Completed
	• occurrences of human-made structures and non-native vegetation (as described in BAM Subsection 6.1.2) • corridors or other areas of connectivity linking habitat for threatened entities (as described in BAM Subsection 6.1.3) • water bodies or any hydrological processes that sustain threatened entities (as described in BAM Subsection 6.1.4) • protected animals that may use the proposed wind farm development site as a flyway or migration route (as described in BAM Subsection 6.1.5) • where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community (as described in BAM Subsection 6.1.6)		
	Identify a list of threatened entities that may be dependent upon or may use habitat features associated with any of the prescribed impacts	Table 16 Species Credit Species	Yes
	Describe the importance of habitat features to the species including, where relevant, impacts on life-cycle or movement patterns (e.g. Subsection 6.1.3)	1.5.3.1 Habitat Features Surveys 1.6.1.1 Habitat trees Table 15 Habitat Tree Detail Table 16 Species Credit Species	Yes
	Where the proposed development is for a wind farm: • identify a candidate list of protected animals that may use the development site as a flyway or migration route, including: resident threatened aerial species, resident raptor species and nomadic and migratory species that are likely to fly over the proposal area (as described in BAM Subsection 6.1.5) • provide details of targeted survey for candidate species of wind farm developments undertaken in accordance with BAM Subsection 6.1.5(2–3.) • predict the habitual flight paths for nomadic and migratory species likely to fly over the subject land and map the likely habitat for resident threatened aerial and raptor species (BAM Subsection 6.1.5(4.))	N/A	
Maps			
Introduction – Chapters 2 and 3	Map of the subject land boundary showing the final proposal footprint, including the construction footprint for any clearing associated with temporary/ancillary construction facilities and infrastructure (if BDAR)	Figure 1 Site Map Figure 2 Location Map	Yes

BAM Reference	Information	BDAR Section	Completed
Landscape - Section 3.1, 3.2 and Appendix E	Site Map ● Boundary of subject land ● Cadastre of subject land ● Landscape features identified in BAM Subsection 3.1.3	Figure 1 Site Map Figure 2 Location Map	Yes
	Location Map ● Digital aerial photography at 1:1,000 scale or finer ● Boundary of subject land ● Assessment area (i.e. the subject land and either 1500 m buffer area or 500 m buffer for linear development) ● Landscape features identified in BAM Subsection 3.1.3 ● Additional detail (e.g. local government area boundaries) relevant at this scale	Figure 1 Site Map Figure 2 Location Map	Yes
	Landscape features identified in BAM Subsection 3.1.3 and to be shown on the Site Map and/or r Location map include: ● IBRA bioregions and subregions ● rivers, streams and estuaries ● Identified Landscape Features and important Identified Landscape Features ● connectivity of different areas of habitat ● karst, caves, crevices, cliffs, rocks and other geological features of significance and if required, soil hazard features ● areas of outstanding biodiversity value occurring on the subject land and assessment area ● any additional landscape features identified in any SEARs for the proposal ● NSW (Mitchell) landscape on which the subject land occurs	Figure 1 Site Map Figure 2 Location Map	Yes
Native vegetation, Chapter 4, Appendix A and Appendix H	Map of native vegetation extent within the subject land at scale not greater than 1:10,000 including identification of cleared areas (as described in BAM Section 4.1(1–3.)) and all parts of the subject land that do not contain native vegetation (BAM Subsection 4.1.2)	Figure 1 Site Map Figure 2 Location Map Figure 3 Regional Vegetation Mapping Figure 4 Ground-Truthed Vegetation Map	Yes
	Map of PCTs within the subject land (as described in BAM Section 4.2(1.))	Figure 4 Ground-Truthed Vegetation Map	Yes
	Map the location of floristic vegetation survey plots and vegetation integrity survey plots relative to PCTs boundaries	Figure 4 Ground-Truthed Vegetation Map	Yes
	Map of TEC distribution on the subject land and table of TEC listing, status and area (ha)	N/A	
	Map of patch size locations for each native vegetation zone and table of patch size areas (as described in BAM Subsection 4.3.2)	Figure 2 Location Map Figure 4 Ground-Truthed Vegetation Map Table 4 & 5 PCT Determination Tables	Yes

BAM Reference	Information	BDAR Section	Completed
		Table 9 Summary of Vegetation Zones Areas	
Prescribed impacts Chapter 6	Map showing location of any prescribed impact features (i.e. karst, caves, crevices, cliffs, rocks, human-made structures, etc.)	N/A	
	Maps of habitual flight paths for nomadic and migratory species likely to fly over the site and maps of likely habitat for threatened aerial species resident on the site (for wind farm developments only)	N/A	
Tables			
Native vegetation, Chapter 4, Appendix A and Appendix H	Table of current vegetation integrity scores for each vegetation zone within the site and including: ● composition condition score ● structure condition score ● function condition score ● presence of hollow bearing trees	Table 9 Summary of Vegetation Zones Areas Table 15 Habitat Tree Detail Table 10 - VIS for PCT 1600 - Severely Degraded & Degraded	Yes
Threatened Species, Chapter 5	Table showing ecosystem credit species in accordance with BAM Section 5.1.1, and identifying: ● the ecosystem credit species removed from the list ● the sensitivity to gain class of each species	Table 11 Predicted Ecosystem Credit Species Table 12 Potential Species Credit Species Table 16 Species Credit Species Table 25 Ecosystem Credit Requirements	Yes
	Table detailing species credit species in accordance with BAM section 5.2 and identifying: ● the species credit species removed from the list of species because the species is considered vagrant, out of geographic range or the habitat or micro habitat features are not present ● the candidate species credit species not recorded on the subject land as determined by targeted survey, expert report or important habitat map	Table 16 Species Credit Species	Yes
	Table detailing species credit species recorded or assumed as present within the subject land, habitat constraints or microhabitats associated with the species, counts of individuals (flora)/extent of suitable habitat (flora and fauna) (as described in BAM Subsection 5.2.6) and biodiversity risk weighting (BAM Section 5.4)	Table 11 Predicted Ecosystem Credit Species Table 25 Ecosystem Credit Requirements Table 12 Potential Species Credit Species Table 16 Species Credit Species	Yes
Prescribed impacts Chapter 6			
Data			

BAM Reference	Information	BDAR Section	Completed
Landscape - Section 3.1, 3.2 and Appendix E	All report maps as separate jpeg files / Individual digital shape files of: ● subject land boundary ● assessment area ((i.e. subject land and 1500 m buffer area) boundary ● cadastral boundary of subject land ● areas of native vegetation cover ● landscape features	Attached files	Yes
Native vegetation, Chapter 4, Appendix A and Appendix H	All report maps as separate jpeg files ● Plot field data (MS Excel format) ● Plot field data sheets		Yes
	Digital shape files of: ● PCT boundaries within subject land ● TEC boundaries within subject land ● vegetation zone boundaries within subject land ● floristic vegetation survey and vegetation integrity plot locations		Yes
Threatened Species, Chapter 5	Digital shape files of suitable habitat identified for survey for each candidate species credit species		Yes
	Survey locations including GPS coordinates of any plots, transects, grids		Yes
	Digital shape files of each species polygon including GPS coordinates of located individuals		Yes
	Species polygon map in jpeg format		Yes
	Expert reports and any supporting data used to support conclusions of the expert report		N/A
	Field data sheets detailing survey information including prevailing conditions, date, time, equipment used, etc		Yes
Prescribed impacts Chapter 6	● Digital shape files of prescribed impact feature locations ● Prescribed impact features map in jpeg format		Yes

Stage 2 Checklist

BAM Reference	Information	BDAR Section	Completed
Report			
Avoid and minimise impacts – Chapter 7	Demonstration of efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the proposal location in accordance with Chapter 7, including an analysis of alternative: ● modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology ● routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route ● alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location ● alternative sites within a property on which the proposal is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site	2.2 Impact Avoidance Measures 1.6.1.1 Habitat trees Table 16 Species Credit Species	Yes
	Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design (as described in BAM Subsections 7.1.2 and 7.2)	2.1.1 Project Design 2.2 Impact Avoidance Measures Appendix G Other Legislation	Yes
	Identification of any other site constraints that the proponent has considered in determining the location and design of the proposal (as described in BAM Subsection 7.2.1(3.))	2.1.1 Project Design 2.2 Impact Avoidance Measures	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Determine the impacts on native vegetation and threatened species habitat, including a description of direct impacts of clearing of native vegetation, threatened ecological communities and threatened species habitat (as described in BAM Section 8.1)	Table 18 Prescribed Impact Avoidance and Minimisation 2.2 Impact Avoidance Measures Appendix G Other Legislation	Yes
	Assessment of indirect impacts on vegetation and threatened species and their habitat including (as described in BAM Section 8.2): ● description of the nature, extent, frequency, duration and timing of indirect impacts of the proposal	2.2 Impact Avoidance Measures	Yes

BAM Reference	Information	BDAR Section	Completed
	• documenting the consequences to vegetation and threatened species and their habitat including evidence-based justifications • reporting any limitations or assumptions, etc. made during the assessment • identification of the threatened entities and their habitat likely to be affected		
	Assessment of prescribed biodiversity impacts (as described in BAM Section 8.3) including: assessment of the nature, extent and duration of impacts on the habitat of threatened species or ecological communities associated with: • karst, caves, crevices, cliffs, rocks and other features of geological significance • human-made structures • non-native vegetation • connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range • movement of threatened species that maintains their life cycle • water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities assessment of the impacts of wind turbine strikes on protected animals assessment of the impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	1.2.2 Identified Landscape Features 2.1 Avoid and Minimise Summary Table 12 Potential Species Credit Species	Yes
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	Identification of measures to mitigate or manage impacts in accordance with the recommendations in BAM Sections 8.4 and 8.5, including: • techniques, timing, frequency and responsibility • identify measures for which there is risk of failure • evaluate the risk and consequence of any residual impacts • document any adaptive management strategy proposed	2.2 Impact Avoidance Measures 2.2.1 Project Design 2.2.5 General Construction & Operation Table 18 Prescribed Impact Avoidance and Minimisation Table 19 Direct Impact Assessment Table 20 Prescribed Impact Assessment Table 21 Indirect Impact Assessment Table 22 Residual Impact Assessment	Yes
	Identification of measures for mitigating impacts related to:	2.2 Impact Avoidance Measures	Yes

BAM Reference	Information	BDAR Section	Completed
	• displacement of resident fauna (as described in BAM Subsection 8.4.1(2.)) • indirect impacts on native vegetation and habitat (as described in BAM Subsection 8.4.1(3.)) • mitigating prescribed biodiversity impacts (as described in BAM Subsection 8.4.2)	Tables 18-22	
	Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain (BAM Section 8.5)	2.2 Impact Avoidance Measures Tables 18-22	Yes
Impact Summary - Chapter 9	Identification and assessment of impacts on TECs and threatened species that are at risk of a serious and irreversible impacts (SAII, in accordance with BAM Section 9.1) including: • addressing all criteria in Subsection 9.1.1 for each TEC listed as at risk of an SAII present on the subject land • addressing all criteria in Subsection 9.1.2 for each threatened species at risk of an SAII present on the subject land • documenting assumptions made and/or limitations to information • documenting all sources of data, information, references used or consulted • clearly justifying why any criteria could not be addressed	2.1 Avoid and Minimise Impacts Table 12 Potential Species Credit Species	Yes
	Identification of impacts requiring offset in accordance with BAM Section 9.2	2.5 Biodiversity Credit Report Appendix E – Biodiversity Credit Report	Yes
	Identification of impacts not requiring offset in accordance with BAM Subsection 9.2.1(3.)	2.4.4 Vegetation Clearance Not Requiring Offsetting	Yes
	Identification of areas not requiring assessment in accordance with BAM Section 9.3	2.4.4 Vegetation Clearance Not Requiring Offsetting	Yes
Biodiversity credit report – Chapter 10	Description of credit classes for ecosystem credits and species credits at the development or clearing site or land to be biodiversity certified (BAM Section 10.2)	2.4 Summary of Potential Impacts on Biodiversity Appendix E Biodiversity Credit Report	Yes
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Land-based conservation measures including (strategic biodiversity certification only): • identification of parcels subject to land-based conservation measures • identification of land-based conservation measures proposed for each parcel • supporting information to demonstrate suitability of land-based conservation measures (Appendix J)	N/A	Yes

BAM Reference	Information	BDAR Section	Completed
	• credit score of land-based conservation measures (Appendix J)		
	Biodiversity certification strategy including: • land proposed for biodiversity certification • land proposed for biodiversity conservation • proposed conservation measures • legal mechanisms for securing delivery of proposed conservation measures • parties to the biodiversity certification and responsibilities, noting where biodiversity certification agreements are proposed • timing for delivery of conservation measures • funding sources for delivery of conservation measures • framework for monitoring, reporting or auditing implementation of conservation measures	N/A	
Maps			
Avoid and minimise impacts – Chapter 7	Map of alternative footprints considered to avoid or minimise impacts on biodiversity values; and of the final proposal footprint, including construction and operation		
	Maps demonstrating indirect impact zones where applicable	Appendix A – Development Plan	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Maps showing areas of direct and indirect impact.	Figure 7 – Impacted Vegetation	Yes
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	No Maps		
Impact Summary – Chapter 9	Map showing the extent of TECs at risk of an SAII within the subject land	N/A	Yes
	Map showing location of threatened species at risk of an SAII within the subject land	N/A	
	Map showing location of: • impacts requiring offset • impacts not requiring offset • areas not requiring assessment	Figures 1, 4, 7 and 8	Yes

BAM Reference	Information	BDAR Section	Completed
Impact Summary - Chapter 10	No Maps		
Biodiversity credit report – Chapter 10	No Maps		
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Maps showing areas of retention and proposed Stewardship Site.	N/A	Yes
Tables			
Avoid and minimise impacts – Chapter 7	Table of measures to be implemented to avoid and minimise the impacts of the proposal, including action, outcome, timing and responsibility	Tables 17-22	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	Table showing change in vegetation integrity score for each vegetation zone as a result of identified impacts	Table 10 – VIS for PCT 1600 – Severely Degraded & Degraded	Yes
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	Table of measures to be implemented to mitigate and manage impacts of the proposal, including action, outcome, timing and responsibility	Tables 17-22	Yes
Impact Summary - Chapter 9	No Tables		
Impact Summary - Chapter 10	Table of PCTs requiring offset and the number of ecosystem credits required	Table 26 – Species Credit Requirements	Yes
	Table of threatened species requiring offset and the number of species credits required	Table 26 – Species Credit Requirements	Yes
Biodiversity credit report – Chapter 10	Table of credit class and matching credit profile	Appendix E – Biodiversity Credit Report	Yes
Biodiversity certification offsets and strategy	Tables as per Appendix M as required in relation to any land-based conservation measures	N/A	

BAM Reference	Information	BDAR Section	Completed
(biodiversity certification only)	Table of credit scores for land-based conservation measures, including scores produced by BAM and weighting adjusted scores as per Appendix J	N/A	
Data			
Avoid and minimise impacts – Chapter 7	Digital shape files of: ● final proposal footprint ● direct and indirect impact zones Maps in jpeg format	Attached files	Yes
Assessment of Impacts - Chapter 8, Section 8.1 and 8.2	No data.		
Mitigation and Management of Impacts - Chapter 8, Section 8.4 and 8.5	No Data		
Impact Summary - Chapter 9	Digital shape files of: ● extent of TECs at risk of an SAII within the subject land ● location of threatened species at risk of an SAII within the subject land ● boundary of impacts requiring offset ● boundary of impacts not requiring offset ● boundary of areas not requiring assessment		Yes
	Maps in jpeg format		
Impact Summary - Chapter 10	Submitted proposal in the BAM Calculator		Yes
Biodiversity credit report – Chapter 10	BAM credit report in pdf format		Yes

BAM Reference	Information	BDAR Section	Completed
Biodiversity certification offsets and strategy (biodiversity certification only) - Chapter 12 and Appendix J	Digital shape files of parcels of land proposed for land-based conservation measures	N/A	N/A
	Maps in jpeg format	N/A	N/A

Appendix K – CVs

Craig Anderson

Curriculum Vitae

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

Qualifications

- Bachelor of Applied Science (Environmental Assessment & Management) University of Newcastle, New South Wales (1994).
- Completing a Graduate Diploma in Archaeological Heritage through University of New England (one subject to complete).
- NSW Scientific Investigation Licence SL101313
- NSW Animal Research Authority
- NSW Accredited Biobanking Assessor No. 150
- NSW Biodiversity Accredited Assessor BAAS: 17002

Further Education & Training

- Biobank and Biocertification Assessors Training Course / BAAS Fast-track Accreditation Course
- Animal Ethics Training (University of Newcastle / NSW DPI)
- RFS / PIA NSW Consulting Planners Bushfire Training
- Bush Regeneration Training
- OH&S Induction Training / Green Card
- NSW Driver's Licence: Car (Class "C"). Experienced 4WD operator.
- Occupational Health & Safety Training, including legal compliance requirements of Officers (Standard 11 & S1,S2,S3).
- + various other vocational environmental and computer based training sessions.

Fields of Competence

- Production and peer review of detailed environmental impact assessment documentation. Author and

- / or Manager of hundreds of ecological / environmental / bushfire / historical heritage / archaeological heritage / strategic & statutory planning documents over nearly 25 years of environmental work

- Biobanking & Biodiversity Offset Commissions – initial scoping and feasibility, BAM impact assessments and BDAR reporting, biobank calculations, Stewardship site creation

- Detailed ecological field survey, covering all aspects of terrestrial and aquatic flora and fauna

- Expert witness legal representation

- Ecological Management Planning, ranging from individual species to full ecosystem management

- Project Management and delivery of complex projects, including projects worth more than $100M

- Project Management (including areas outside environmental sphere)

- Environmental Due Diligence processes for both asset procurement and divestment

- Management and co-ordination of teams producing EIA documentation

- Identification of strategic approval pathways and key project risk evaluation and management

- Extensive experience in conflict resolution, impact mediation and outcome negotiation on large scale and contentious projects

- Environmental peer review and ecological compliance auditing

- Project advocacy and representation with all levels of stakeholders

- Detailed knowledge of land and infrastructure development processes

Relevant Employment History

2013 – Present	**Director/Principal Consultant** Anderson Environment & Planning, Newcastle
2012- Present	**Director** Habitat Indoor/ Outdoor Living, Furniture, Homewares & Design, Newcastle.
2010-2012	**General Manager Sustainable Development** Coal Mining Company, Cockatoo Coal PtyLtd, Newcastle/Sydney/ Brisbane

2009 – 2010	**Independent Environmental Expert** Donaldson Conservation Trust
2010	**Principal- Environment**
	RPS, Development Consultants, Newcastle
2006-2009	**Manager Environment Group**
	RPS HSO, Development Consultants, Newcastle
2001-2006	**Manager Environment Group/ Director**
	Harper Somers O'Sullivan, Development Consultants, Newcastle
2000-2001	**Senior Ecologist & NSW Projects Manager**
	Wildthing Environmental Consultants, Salt Ash.
1996-1999	**Ecologist**
	Wildthing Environmental Consultants, Salt Ash.
1995-1996	**Ecologist/Environmental Officer**
	Pulver Cooper & Blackley, Engineers & Surveyors, Newcastle.
1995	**Environmental Officer/ Cadastral Survey Assistant**
	Kel Nagle Cooper & Associates, Golf Course Design & Construction,Newcastle.

Ian Benson

Curriculum Vitae

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

Qualifications

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

Further Education & Training

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

Fields of Competence

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

Relevant Employment History

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

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

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

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

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

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

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

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

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

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

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

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

Key Project Experience

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

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

Natalie Black

Curriculum Vitae

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

Qualifications

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

Further Education & Training

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

Fields of Competence

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

Relevant Employment History

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

BONNI YARE

Curriculum Vitae

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

Qualifications

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

Further Education & Training

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

Fields of Competence

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

Relevant Employment History

2019 – Present **Ecologist**
Anderson Environment & Planning, Newcastle

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

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

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

Relevant Ecological Experience

2018 - present **Field assistance**

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

2019 **Undergraduate Research Project associated with NPWS**

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

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

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

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

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

THOMAS STEPHENS

Curriculum Vitae

Thomas works with AEP in the role of Ecologist. He is a graduate of environmental science and management, and has industry experience in environmental fields, involving fauna and flora surveying, consultancy projects and natural resource management. His background in environmental fields with his growing ecological knowledge is utilised in a diverse array of applications in his current role.

Qualifications

- Bachelor of Environmental Science and Management (Sustainability), The University of Newcastle (2021)

Further Education & Training

- Class C NSW Driver's License
- Work Health & Safety General Construction Induction
- Senior First Aid
- Work Safely at Heights
- Tree Access Systems Level 1

Fields of Competence

- Ecological field surveys
- Fauna surveys and trapping
- Natural resource management
- Nest box installation
- Adept experience in operating 4x4 vehicles

Relevant Employment History

March 2022 - Present — **Ecologist**
Anderson Environment & Planning, Newcastle

Currently employed by Anderson Environment & Planning to assist in the provision of consulting services to land, property, legal and government sectors. Covering ecological, project management, environmental, planning services, advices, strategy and representation. Expanding knowledge of field survey methodology, report writing, mapping and data manipulation.

January 2022 – April 2022 — **Ecologist**
Active Green Services, NSW

August 2021 – January 2022 — **Ecologist and Bushfire Consultant**
Firebird ecoSultants, Newcastle

Relevant Volunteer Experience

- Industry Placement (National Parks and Wildlife Service, 2020-2021)

Kelly Drysdale

Curriculum Vitae

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

Qualifications

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

Further Education & Training

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

Fields of Competence

- Field assessment including: targeted fauna and flora surveys, BAM plots, Koala Spot Assessment Technique (SAT) surveys, tree surveys, HBT and nest box inspections.
- Assessment of sites using the Biodiversity Assessment Method (BAM) under the Biodiversity Offsets Scheme, production of Biodiversity Development Assessment Reports and Ecological Assessment Reports
- Production of assessments against various legal instruments such as EPBC Act fauna and flora assessments, State Environmental Planning Policy Biodiversity and Conservation) 2021 – Chapter 4 Koala Habitat Protection 2021, State Environmental Planning Policy (Resilience and Hazards) 2021 – Chapter 2 Coastal Management, Water Management Act 2000 and the Environment Protection and Biodiversity Conservation Act 1999
- Bushfire threat analysis and reporting
- Liaison with clients/site/company/government representatives

Relevant Employment History

Feb 2021- Current **Ecology Project Manager**- Anderson Environment & Planning, Newcastle, NSW

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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