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Ecological Assessment Report

Proposed Development
Lot 73 DP 739305, 1620 Bingleburra Rd, Bingleburra, NSW

Prepared for: Mal Graham
C/- Perception Planning

27 March 2023

AEP Ref: 3168
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Project Number	3168
Client Name	Mal Graham C/- Perception Planning
AEP Project Team	Edouard Loisance Sebastien Doleac Samuel Rayfield

Revision

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Draft	14/02/2023	Sebastien Doleac	Edouard Loisance	Edouard Loisance
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Draft	14/02/2023	Lauren Power	Perception Planning
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EXECUTIVE SUMMARY

Anderson Environment & Planning was commissioned by Perception Planning on behalf of Mal Graham (the client) to undertake an Ecological Assessment Report (EAR) for a proposed water crossing within Lot 73 DP 739305, 1620 Bingleburra Road, Bingleburra NSW (the Study Area). The site is currently zoned RU1 – Primary Production. The proposal includes the construction of a water crossing required for the proposed road access (Subject Site).

The report is specifically intended to indicate the likelihood of the proposed development having a significant impact on potentially occurring threatened species or ecological communities. In this regard, the report aims to recognise the relevant requirements of the *Environmental Planning & Assessment Act 1979*, the *Biodiversity Conservation Act 2016* (NSW) (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Ground-truthing of the vegetation present within the Subject Site revealed that the vegetation section to be impacted by the proposal not commensurate with any PCT, with no representative species and a highly disturbed and managed ground layer comprised primarily of exotic grasses.

Assessment under the Five-part Test of Significance of Impacts determined that no significant impacts upon threatened entities listed under the *BC Act* are likely to occur if mitigation measures are implemented, and consideration of the *EPBC Act* revealed that impacts on Matters of National Environmental Significance are unlikely to occur, as is a referral to the Commonwealth.

Review of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* reveals that this SEPP is applicable to the site in relation to *Chapter 3 Koala Habitat Protection 2020*. An assessment against the provisions of this chapter concluded that no significant impacts on Koala are expected as a result of the proposal. Furthermore, consultation of *Chapter 2 Coastal Management* of *State Environmental Planning Policy (Resilience and Hazards) 2021* revealed that the Subject Site is not mapped as containing lands subject to coastal management and the SEPP does not apply.

General recommendations and mitigation measures have been included in the report to minimise environmental impacts of the proposal. These measures should provide adequate protection during the construction phase for native flora and fauna in the locality.

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1.0 Introduction

The proposed development is for a water crossing within Lot 73 DP 739305, at 1620 Bingleburra Rd, Bingleburra, NSW (the Study Area).

Anderson Environment & Planning was commissioned by Perception Planning on behalf of Mal Graham (the client) to undertake an Ecological Assessment Report (EAR) for the proposed development. The site is currently zoned RU1 – Primary Production. The proposed development encompasses the southern side of the parent lot, and will incur a road access with a water crossing as depicted in **Figure 1**.

Anderson Environment & Planning (AEP) have undertaken necessary investigations for the production of an EAR. This assessment has been undertaken with reference to the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), the *NSW Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

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

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

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

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

> Anderson Environment & Planning (2023). *Ecological Assessment Report for Proposed Development at 1620 Bingleburra Rd, Bingleburra, NSW*. Unpublished report for Perception Planning. February 2023.

2.0 Site Particulars

Table 1 – Site Particulars

Detail	Comments
Client	Mal Graham C/- Perception Planning
Address	1620 Bingleburra Rd, Bingleburra, NSW 2311
Title(s)	Lot 73 DP 739305
Study Area	The entirety of Lot 73 DP 739305 (approx. 100ha)
Subject Site	The Subject Site is located to the southern section of the lot and encompasses the development footprint (one water crossing), within the above lot, covering approximately 0.02ha.
LGA	Dungog Shire
Zoning	Under the *Dungog Local Environmental Plan 2014* (the LEP), the Study Area comprises land zoned RU1 – Primary Production.
Current Land Use	Lot 73 DP 739305 is currently undeveloped and is predominantly comprised of managed grassland used for cattle grazing purposes.
Surrounding Land Use	The site is surrounded by farmlands and managed grasslands with native forests occurring to the north and west of the site. Lewinsbrook Creek flows to the south and east of the lot while Allyn River is located to the west of the Subject Site. Surrounding lands are zoned RU1 and East Gresford is located southwest from the site.

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

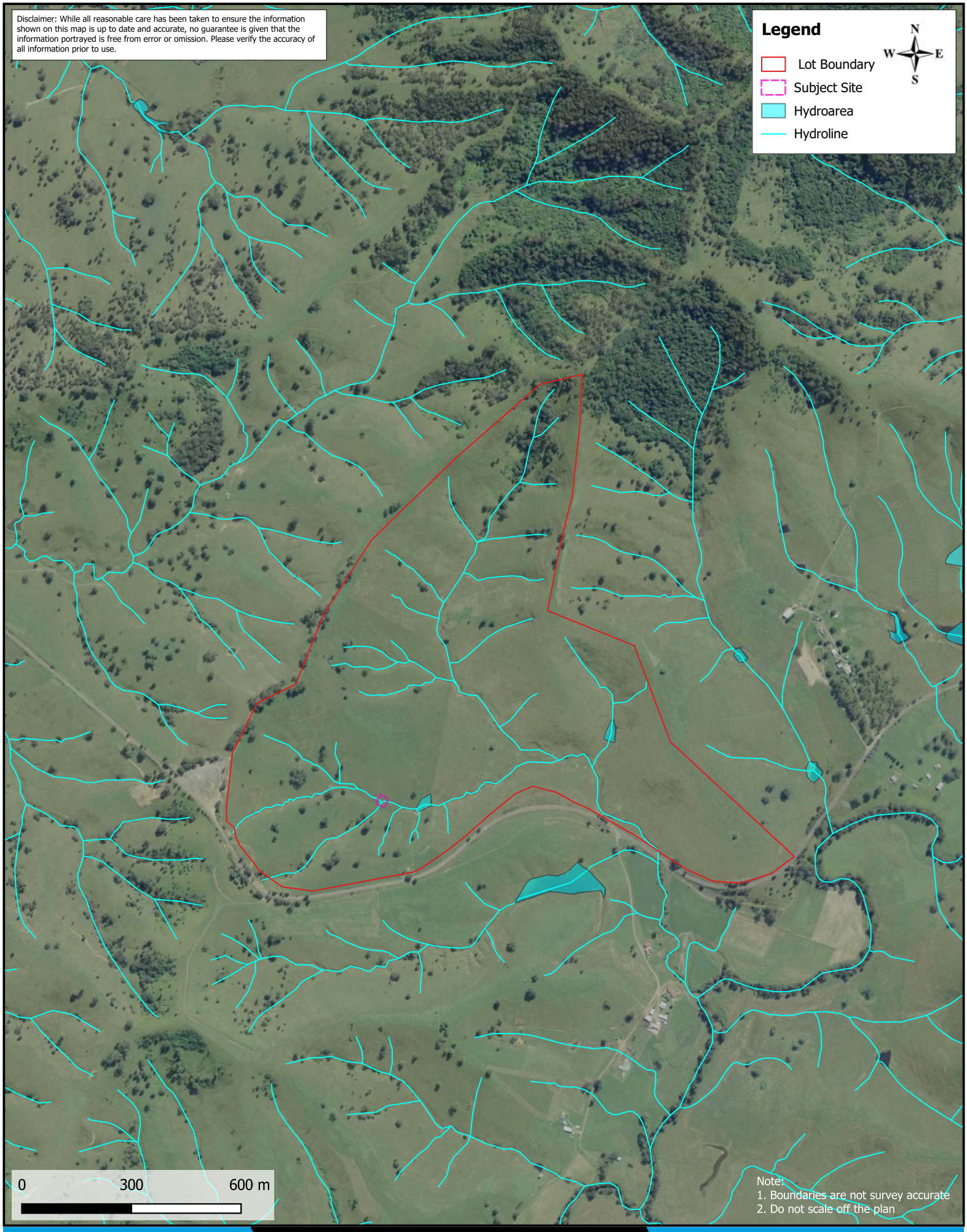

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Figure 1 - Location Map

Date: Feb 2023

Location: 1620 Bingleburra Road, Bingleburra 2311

Client: Mal Graham

AEP ref: 3168

3.0 Proposed Development

It is proposed to construct a road access to the proposed dwelling for which one water crossing is required. The water crossing is the subject of the present assessment and will be located to the south of the lot. All trees proximate to the Subject Site are proposed to be retained. The crossing will be located upstream a well-formed creek and will be approximately 4m-wide.

Figure 2 depicts the proposed development plan within the Subject Site.

Figure 2 – Proposed Development Plan

4.0 Scope and Purpose

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

Also afforded consideration were the *EPBC Act*, and relevant SEPPs.

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

Impact assessment was undertaken with due reference to the "*Threatened Species Test of Significance Guidelines"* (OEH, 2018).

Specifically, the scope of this study is to:

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

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

5.0 Study Certification and Licencing

The fieldwork for this assessment was undertaken by Edouard Loisance (MMgt & DipCaLM) and Samuel Rayfield BComm); reporting was undertaken by Sebastien Doleac (B.Sc & MConserv. Biol. & MRes), and review was undertaken by Edouard Loisance (MMgt & DipCaLM) of Anderson Environmental & Planning.

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101313;
- Animal Research Authority (Trim File No: 14/600(2)) issued by NSW Agriculture; and
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 14/600(2)) issued by NSW Agriculture.

Certification:

As the principal author, I, Edouard Loisance, make the following certification:

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

Commonwealth, state and local government policies and guidelines formed the basis of project surveying methodology, unless specified departures from industry standard guidelines are justified for scientific and/or animal ethics reasons; and

All research workers have complied with relevant laws and codes relating to the conduct of flora and fauna research, including the Animal Research Act 1995, National Parks and Wildlife Act 1974 and the Australian Code of Practice for the Care and Use of Animals for Scientific Purposes.

Principal Author and Certifier:

Edouard Loisance

Lead Ecology Works Manager
Anderson Environment & Planning

6.0 Methodology

The field surveys for the site have been prepared and performed with due recognition of the relevant state survey guidelines (DEC 2004; DPIE 2020a; DPIE 2020b; DPE 2022b).

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

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

6.1 Information Sources

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

- Aerial Photograph Interpretation (API) of the site and surrounding locality;
- *NSW Biodiversity Values Map* (accessed January 2023);
- DPE State Vegetation Type Map (2022a);
- State survey guidelines (DEC 2004; DPIE 2020a; DPIE 2020b; DPE 2022b);
- DPE Threatened Species, Populations and Ecological Communities website (*https://www.environment.nsw.gov.au/AtlasA pp/UI_Modules/TSM_/Default.aspx?a=1*) (accessed January 2023); and
- Collective knowledge gained from previous ecological survey and assessment in the Greater Hunter region over the past 25 years.

In addition, database searches were carried out, namely:

- Review of flora and fauna records held by the BioNet Atlas of NSW Wildlife within a 5km radius of the site (January 2023); and
- Review of flora and fauna records held by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search within a 5km radius of the Subject Site (January 2023).

6.2 Considerations of Biodiversity Offsets Scheme

There are three criteria that require assessment under the Biodiversity Offsets Scheme (BOS) to determine whether or not entry into the BOS is required. The three criteria include;

- Whether or not the site contains Biodiversity Values Mapped land;
- Whether or not it exceeds the Area Clearing Threshold applicable to the minimum lot size; and / or
- Whether or not a 5-part Test of Significance determines that a significant impact on threatened biodiversity is likely to occur.

The criteria are addressed below.

6.2.1 Biodiversity Values Map

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

The BV Map does not intersect with the Subject Site; therefore, the proposal does not trigger the BOS and the requirement for a Biodiversity Development Assessment Report (BDAR) under this criterion (refer **Appendix D**).

6.2.2 Area Clearing Threshold

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

Table 2 - Area Clearing Thresholds (BC Act)

Minimum lot size	Threshold for clearing, above which the BOS applies
< 1ha	>0.25ha
1ha to <40ha	>0.5ha
40ha to <1000ha	**>1.0ha**
>1000ha	>2ha

In this case, as per the Biodiversity Values Map and Threshold Report included in **Appendix C**, the applicable minimum lot size is 60ha under the Dungog LEP. Therefore, the applicable area clearing threshold is 1.0ha. As the area of vegetation to be removed totals approx. 0.02 ha, the BOS is not triggered, and as such the preparation of a BDAR is not required based on the clearing threshold.

6.2.3 Test of Significance

Following the above assessments, it is a requirement to determine whether or not the development is likely to significantly affect threatened species, ecological communities or their habitats using a Test of Significance. The Test of Significance is used to undertake qualitative analysis of the likely impacts and determine whether further assessment is required in association with the development. As part of this Ecological Assessment Report, a Five-part Test of Significance has been undertaken in **Section 9.0**.

6.3 Field Survey

All fieldwork was conducted within the Subject Site as shown in **Figure 5.**

6.3.1 Vegetation Communities

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

- Consideration of regional mapping for the site by SVTM (DPE, 2022a);
- Aerial Photo interpretation (API) to identify any notable variations within the site;
- Consultation of 1:25,000 topographic map series for the area;

- 1x Botanical/Fauna Survey within Subject Site.

The final derived vegetation map was based on vegetation mapping and field surveys

Consideration was given to the potential for the derived vegetation communities to constitute EECs as listed under the *BC Act* and/or *EPBC Act*. The floristic composition, geomorphological characteristics and geographical extent were important considerations in this process. The type and location of the relevant vegetation communities can be seen in **Figure 4.**

6.3.2 Flora

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

- Identification of all vascular plant species encountered during fieldwork;
- Survey involved systematic coverage of the Subject Site. The Random Meander Technique (Cropper, 1993) was utilised to maximise species encountered. All vascular plant species encountered during fieldwork were recorded; and
- 1x Flora Survey plot was undertaken within the Subject Site and along the creek in the riparian zone.

6.3.3 Habitat

An assessment of the relative habitat values present within the Subject Site was carried out. This assessment focused primarily on the identification of specific habitat types and resources within the site favoured by known threatened species from the region. The assessment also considered the potential value of the Subject Site (and surrounding areas) for all major guilds of native flora and fauna.

The assessment was based on the specific habitat requirements of each threatened fauna species in regards to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

In particular, focus was put on documenting the presence of key habitat features such as tree hollows. Hollows are an important resource utilised by a variety of fauna, and are particularly relevant for several of the likely key threatened species in this locality. Vertebrate and invertebrate species use hollows as diurnal or nocturnal shelter sites, for rearing young, feeding, thermoregulation, and to facilitate ranging behaviour and dispersal.

Tree hollows were surveyed for within the Study Area utilising the methodology of tree hollow identification set by OEH in the BioBanking field plot methodology (2009), namely:

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

6.3.4 Fauna

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

Avifauna Surveys

The presence of avifauna within the site was assessed via a diurnal fauna survey. For the diurnal survey, birds were identified by direct observation or by recognition of calls or distinctive features such as nests, feathers etc.

Mammals

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

Incidental Observations & Secondary Indications

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

6.3.5 Details of Field Surveys

A summary of the survey effort is below in **Table 3** and **Figure 6**.

Table 3 – Field Survey Periods

Date	Time	Field Activity	No. of Persons on Site
25/01/2023	9:00 – 11:00	Site meander 1 x Fauna/Flora Survey Habitat assessment Incidentals	2

The above survey methodology is considered to provide sufficient understanding of the biodiversity of the Subject Site.

In addition, by applying rigorous habitat assessment to more mobile species identified in BioNet Atlas records within the locality, it was ensured that all possible use of the Subject Site by notable species was considered, and accommodated within subsequent ecological assessment and management recommendations.

7.0 Results

7.1 Vegetation Communities

7.1.1 Regional Vegetation Mapping

State vegetation mapping undertaken for the Department of Planning and Environment (2022a) - indicates that non-native vegetation is mapped within the lot boundary. The following plant communities are mapped within the lot boundary:

- PCT 3076 – *Hunter Valley Whalebone Dry Rainforest*, located to the north of the lot boundary;
- PCT 3087 – *Lower North Ranges Riparian Turpentine Forest,* located to the north of the lot boundary and a to the south of the Subject Site;
- PCT 3244 – *Lower North Spotted-Gum-Mahogany-Ironbark Sheltered Forest,* located to the north west of the Subject Site; and
- PCT 3446 – *Lower North Foothills Ironbark-Box-Gum Grassy Forest*, located to the west, south of the Subject Site and north to the lot boundary.

Figure 3 shows the extent of vegetation communities within the Subject Site and surrounding areas as mapped by NSW SVTM (DPE 2022a).

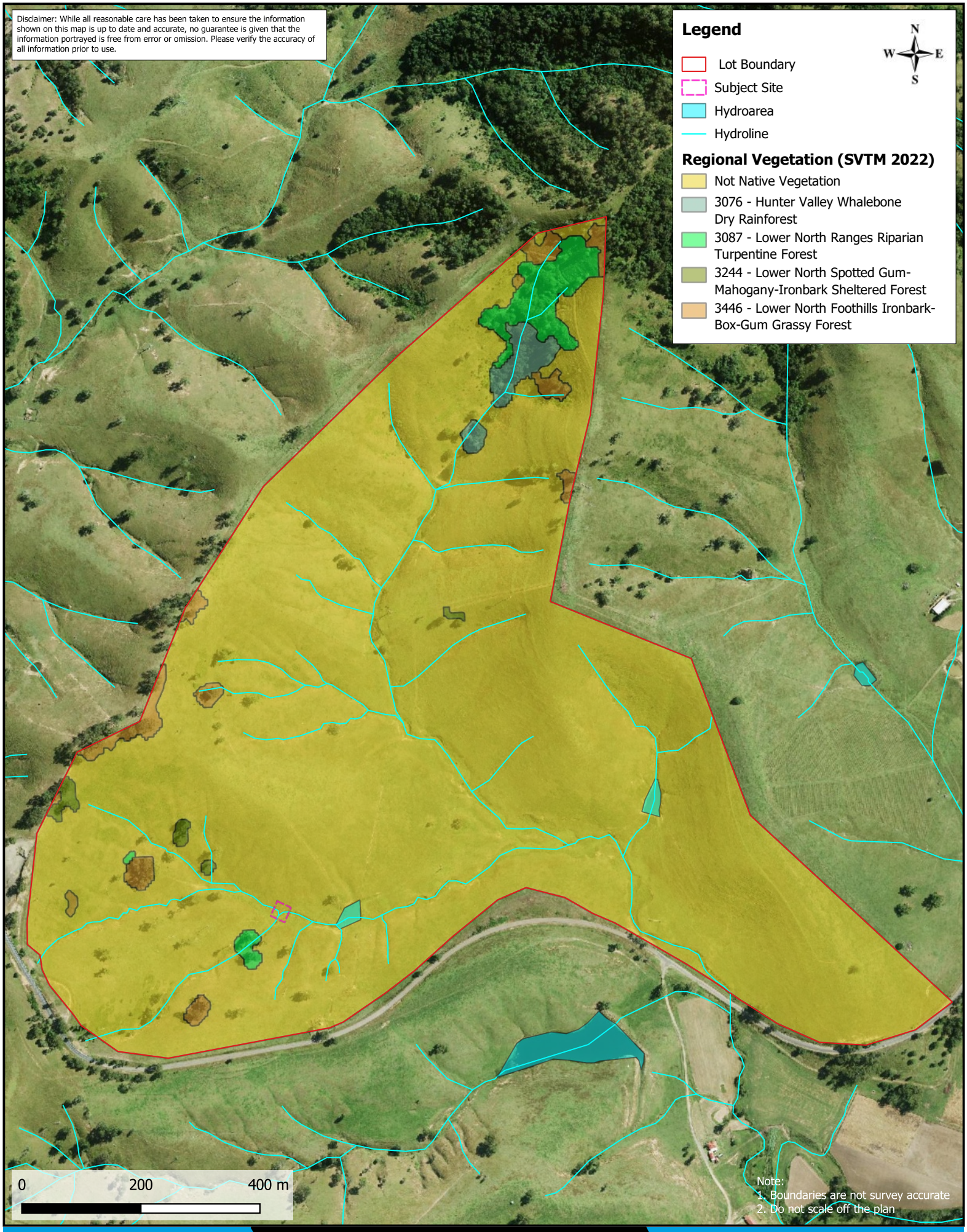

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Figure 3 - Regional Vegetation

Date: Feb 2023

Location: 1620 Bingleburra Road, Bingleburra 2311

Client: Mal Graham

AEP ref: 3168

7.1.2 Ground-truthed Vegetation Mapping

Fieldwork was conducted to identify flora species and determine the occurrence of any Plant Community Types (PCTs) on the Subject Site and surrounding. Vegetation within the Subject site is largely characterised as cattle grazing grassland, with evidence of recent slashing and comprised of primarily exotic grasses.

Vegetation within the Subject Site (Riparian zone), will be impacted to a minor extent. A review of the vegetation zone's composition and condition indicates that vegetation therein is not commensurate with any PCTs, primarily due to the lack of native species present. As such, no PCT was assigned. Further assessment is provided thereafter.

Riparian Vegetation

The native vegetation remnant along the creek of the Subject Site is comprised primarily of exotic grasses with only a few native species. The vegetation zone comprises primarily exotic grasses dominated by *Cenchrus clandestinus* (Kikuyu grass), *Echnichloa crusgalis* (Barnyard Grass), *Sporobolus africanus* (Parramatta grass), *Plantago lanceolata* (Plantain), *Senecio madagascariensis* (Fireweed). A few native grass species were identified on site including *Cynodon dactylon* (Common couch) and *Imperata cylindrica* (Blady Grass). The mid-storey is absent but surrounding canopy trees include sparse individuals of *Corymbia maculata* (Spotted gum) and *Eucalyptus crebra* (Narrow-leaved Ironbark).

Plate 2: Riparian native vegetation within Subject Site – Impact area in the foreground

Figure 4 shows the extent of ground-truthed vegetation identified within the Subject Site.

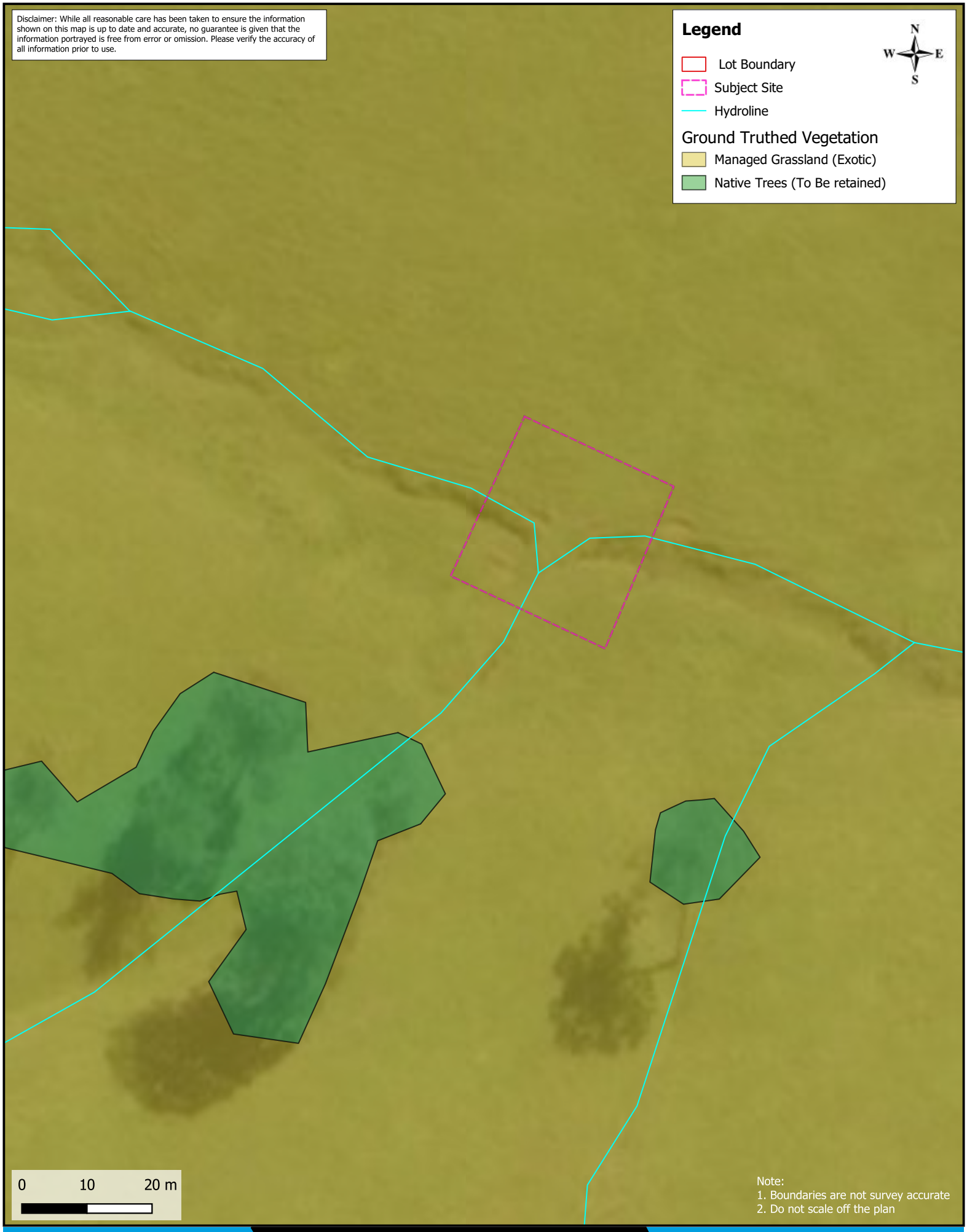

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Figure 4 - Ground Truthed Vegetation

Date: Feb 2023

Location: 1620 Bingleburra Road, Bingleburra 2311

Client: Mal Graham

AEP ref: 3168

7.2 Flora

Flora surveys have resulted in the identification of 29 species within the Subject Site, including 13 exotic species in the lower storey.

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

7.3 Habitat Assessment

The Subject Site offers limited habitat for fauna. The highly managed nature of the grassland and predominantly exotic species composition render habitat value low. No species were observed utilising the subject area for habitat value and no evidence of previous use was observed.

Remnant vegetation near the creek comprises sparse native canopy that is non-connected (*Eucalyptus crebra, Corymbia maculata)* and unlikely to be potential habitat for arboreal mammals. The trees present on site may offer habitat to some bird species but the proposal will have no impacts as trees are to be retained. Impacts to the riparian zone due to the proposed water crossing as a result of the proposal are expected to be minimal (4m width), and limited to an exotic-dominated vegetation zone.

7.4 Fauna

Fauna surveys to date have identified 10 bird species within the Subject Site, and one (1) amphibian species within the creek near the Subject Site.

The majority of the Subject Site and the creek are managed and disturbed, comprising primarily exotic grasses and a few native trees, suggesting that this is not an area of high-value habitat. The proposed development is unlikely to significantly affect the habitat values offered by the site's riparian vegetation and it is not expected that the Subject Site would be utilised by threatened fauna species to any significant degree. The proposed location of the water crossing is located upstream the creek with vegetation primarily composed of exotic species.

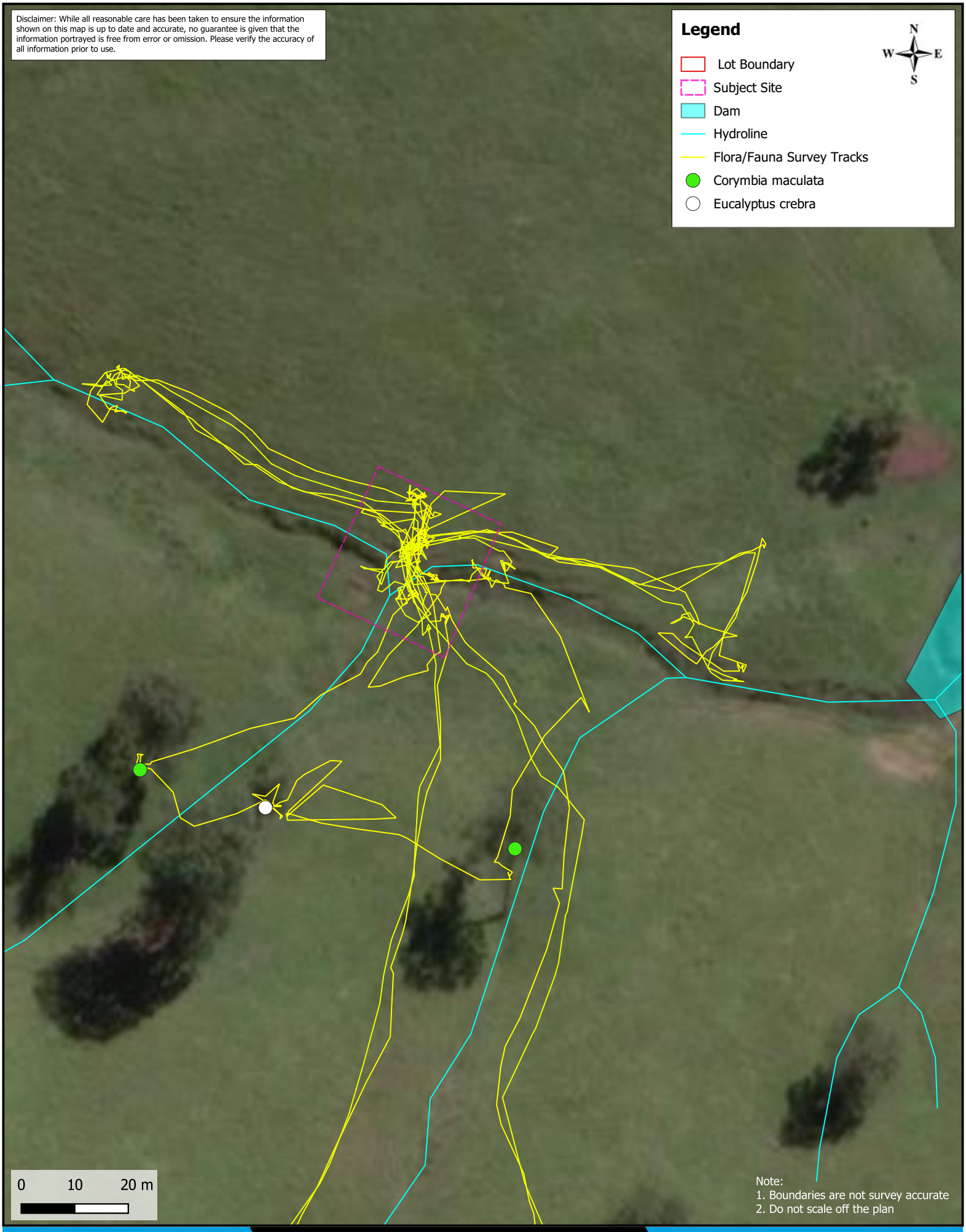

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Figure 5 - Survey Effort

Date: Feb 2023

Location: 1620 Bingleburra Road, Bingleburra 2311

Client: Mal Graham

AEP ref: 3168

7.5 Database Searches

Searches were undertaken of databases within a 20km radius of the Subject Site for BC Act listings and EPBC Act listings. Note that any records considered erroneous, historic only, or obviously of no relevance to the site in regards to habitat (e.g., seabirds, marine species etc.) were omitted.

The potential for listed threatened species to occur within the site is considered in **Table 4** and selection for subject species in **Table 5** below. Detailed ecological profiles of threatened species can be found at:

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

Table 4 – Threatened Species Appraisal (20 km x 20 km)

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Flora					
Cynanchum elegans	White-flowered Wax Plant	E	E	4	There are 4 records located more than 5km to the east and south of the site within patches of dense canopy vegetation. The species is usually associated with dry rainforests and vegetation communities such as Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia* subsp. *integrifolia* coastal scrub; Forest Red Gum *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum *Corymbia maculata* aligned open forest and woodland; and Bracelet Honeymyrtle *Melaleuca armillaris* which do not occur on Site. Considered unlikely to occur.
Rutidosis heterogama	Heath Wrinklewort	V	V	56	Although the species is typically found on sandy soil, moist open forest and roadsides, the 56 records are all located more than 20km south of the Site in a small patch of forest. Considered unlikely to occur.
Acacia pendula	*Acacia pendula* population in the Hunter catchment	E		1	The only record is located within 2.5 km to the south eastern corner of the site but is not considered a natural occurrence of the species (planted). Considered unlikely to occur.

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Eucalyptus glaucina	Slaty Red Gum	V	V	407	There are 407 records within 20 km of the site. A population has been recorded along the Allyn River near East Gresford within 5km of the Site. The species grows in grassy woodland and dry eucalypt forest in fertile and well-watered soil. **Subject Species**.
Eucalyptus largeana	Craven Grey Box	E1	E	18	The 18 records are located within 20km of the Subject Site. The species grows in wet and sub-costal region. Considering the site's characteristics, the species is unlikely to be found on site. Considered unlikely to occur.
Rhodamnia rubescens	Scrub Turpentine	E4A	CE	73	Records are primarily located in dense vegetation patches to the east of the site and within the Barrington Tops National Park. The species is usually found in littoral, subtropical rainforest and wet sclerophyll forests on volcanic and sedimentary soil. Considered unlikely to occur.
Pterostylis chaetophora		V		74	There are 74 records located within 20 km of the Subject Site. The species prefers moist, dry sclerophyll forest with grassy and shrubby understorey. It is typically observed in grassy open forests and native grasslands associated with *Eucalyptus amplifolia, Eucalyptus moluccana, Corymbia maculata Eucalyptus fibrosa, Eucalyptus sideroploia* or *Eucalyptus crebra*. **Subject Species.**

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Fauna					
Amphibians					
Mixophyes balbus	Stuttering Frog	E1	V	34	The records are primarily located in the Barrington Tops National Park to the north of the Subject Site and in Ghin-Doo-Ee National Park to the east of the site. The species is not known or predicted to occur within the Subject Site or within immediate surroundings. Considered unlikely to occur.
Litoria aurea	Green and Golden Bell Frog	E1	V	2	The only two records are located to the east of the Subject Site. The species is typically found near waterbodies containing bullrushes or spikerushes. They prefer unshaded environments free of predators with grassy areas nearby. However, considering the disparity of past records and disturbed condition of the site, the species is unlikely to be found on site. Considered unlikely to occur.
Litoria daviesae	Davies' Tree Frog	V		3	The three records are only located within the Barrington Tops National Park. The site is not located within a known or predicted distribution of the species. Considered unlikely to occur.

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Birds					
Ptilinopus magnificus	Wompoo Fruit-Dove	V		17	Most of the records are located within 20 km of the Subject Site and primarily within the Barrington Tops National Parks. The species is typically found near rainforest, moist eucalyptus forest at low elevation and brush box forests. Considering the site's characteristics, this species is unlikely to be found on site. Considered unlikely to occur.
Circus assimilis	Spotted Harrier	V		7	There are 17 records sparsely located within 20 km of the Subject Site. They are typically observed in native grassy open woodlands that comprise Acacia and Mallee remnants. It can also be found in agricultural land. The species may forage on site. **Subject Species.**
Hieraaetus morphnoides	Little Eagle	V		5	Only 5 records are found within 20 km of the Subject Site. Individuals usually occupy open forest and woodlands including riparian woodlands. However, considering past records, it is unlikely that the species would be foraging on site. Considered unlikely to occur.

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V	62	There are 62 records within 20km of the Subject Site. The species is typically found in open forests and woodlands and is known to forage on Black Sheoak and Forest Sheoak. The species nests on large hollow-bearing eucalypts. **Subject Species.**
Glossopsitta pusilla	Little Lorikeet	V		111	More than 100 records are located within 20km of the Subject Site. This species is found in open eucalypt forest and woodland and often use riparian habitat. Considering the site characteristics, the species may forage on site. **Subject Species.**
Lathamus discolor	Swift Parrot	E1	CE	14	The records are located near dense vegetation remnants. Considering that the site is primarily a grassland and that most records are located 20 km to the South of the Subject Site, the species is unlikely to be found on site. Furthermore, the site is not mapped as containing Important Areas for the species. Considered unlikely to occur.
Neophema pulchella	Turquoise Parrot	V		4	There are four (4) records located to the south of the Subject Site. The species is often found on the edges of eucalypt woodlands near cleared areas. It is also found near creeks of farmlands. The Site comprises multiple watercourses and two dams within the lot boundary. **Subject Species.**

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Ninox strenua	Powerful Owl	V		30	There are 30 records located to the south, east and northeast of the Subject Site. The species requires large forest or woodland corridor but is also found in fragmented areas. Individuals breed and hunt in open sclerophyll forest or woodlands and often hunt in open areas. The species may use the site for foraging purposes. **Subject Species.**
Tyto novaehollandiae	Masked Owl	V		13	Nearby records are primarily located in dense vegetation patches excluding records within the Barrington Tops National Park. They are typically found in forests or at the edge of forests. Considered unlikely to occur.
Tyto tenebricosa	Sooty Owl	V		21	Records are primarily located within the surrounding National Parks in dense canopy forests. Considering the proximity of more suitable habitat, the species is unlikely to be found on site. Considered unlikely to occur.
Chthonicola sagittata	Speckled Warbler	V		124	Past records are primarily located near Cessnock. Due to the distance from the Subject Site, the species is unlikely to be found. Considered unlikely to occur.

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Anthochaera phrygia	Regent Honeyeater	E4A	CE	5	There are 5 records located within 20km of the site. However due to the site characteristics and past record locations, the species is more likely to be found in more suitable habitat near the site. Furthermore, the site is not mapped as containing Important Areas for the species. Considered unlikely to occur.
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		147	There are 147 records within 20km of the Subject Site. Considering site characteristics (deforested grassland), the species has potential to occur in the vicinity of the Subject Site for foraging purposes. **Subject Species.**
Daphoenositta chrysoptera	Varied Sittella	V		115	Past records are primarily located within or at the edge of dense vegetation patches which do not occur on site. Considered unlikely to occur.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V		40	Due to the distance of past records. This species is unlikely to be found on site. Considered unlikely to occur.
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V		7	The species typically prefers dense canopy forests. Considering past records and the site characteristics, the species is more likely to be found in surrounding habitats that are more suitable. Considered unlikely to occur.

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Petroica boodang	Scarlet Robin	V		6	The species is usually found in dry eucalypt forests and woodlands. Past record locations and the site characteristics suggest that the species is unlikely to be found on site. Considered unlikely to occur.
Mammals					
Dasyurus maculatus	Spotted-tailed Quoll	V	E	141	Considering the wide-array of habitat and high mobility of the species as well as the sparsity of past records, the species may be utilise the site as part of a wider foraging range. **Subject Species.**
Phascogale tapoatafa	Brush-tailed Phascogale	V		57	Considering the distance of past records from the Subject Site, the species is unlikely to be found on site. Unlikely to occur due to distance from records. Considered unlikely to occur.
Phascolarctos cinereus	Koala	E1	E	575	Although trees within the sites are not connected to nay vegetation patches, one record has been collected within 2.5 km of the Subject Site in the last 18 years. The site may form part of a wider foraging range. **Subject Species.**

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	84	Numerous records have been collected sparsely within 20km of the Subject Site. Considering the species habitat requirements, individuals may be found on site. **Subject Species.**
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		2	The species may use borrows from mammals present on site and is known to forage in a wide range of habitat types. Despite the paucity of local records, the species may utilise the site as part of a wide foraging range. **Subject Species.**
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V		15	The species is typically found in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. The species may utilise the site as part of a wide foraging range. **Subject Species.**
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		48	The species is typically found in moist habitats with trees taller than 20m. The Study Area largely comprises sparse woodland and grassland. Considered unlikely to occur.
Myotis macropus	Southern Myotis	V		538	The species is typically found near waterbodies. The presence of nearby dams suggests that this species is may forage in the vicinity of the Subject Site. **Subject Species.**

Scientific Name	Common Name	NSW status	Comm. status	Records	Likelihood of Occurrence
Scoteanax rueppellii	Greater Broad-nosed Bat	V		17	The species is typically found in a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. There is limited, yet existing, potential for the species utilise the site as part of a wider foraging range. **Subject Species.**
Miniopterus australis	Little Bent-winged Bat	V		37	The species is typically found in moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. The site is not considered to constitute suitable habitat for the species. Considered unlikely to occur.
Miniopterus orianae oceanensis	Large Bent-winged Bat	V		55	The species is typically found to forage in forested areas and roost in derelict mines, storm-water tunnels, buildings and other man-made structures. As such, the site is considered unlikely to provide suitable habitat for the species. Considered unlikely to occur.

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

From **Table 4** above, the species listed in **Table 5** are considered key subject or indicator species for the Subject Site due to being recorded on site, or having potential to forage and roost or nest on the site. The site potentially forms an important part of a local home range for resident species and some potential habitat will be removed by the proposal.

Table 5 – Subject Species

Scientific Name	Common Name	BC Act listing	EPBC Act listing
Flora			
Eucalyptus glaucina	Slaty Red Gum	V	V
Pterostylis chaetophora		V	
Aves			
Neophema pulchella	Turquoise Parrot	V	
Ninox strenua	Powerful Owl	V	
Calyptorhynchus lathami	Glossy Black-Cockatoo	V	V
Glossopsitta pusilla	Little Lorikeet	V	
Circus assimilis	Spotted Harrier	V	
Pomatostomus temporalis temporalis	Grey-crowned Babbler	V	
Mammals			
Phascolarctos cinereus	Koala	E	E
Dasyurus maculatus	Spotted-tailed Quoll	V	E
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	
Myotis macropus	Southern Myotis	V	
Scoteanax rueppellii	Greater Broad-nosed Bat	V	

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

8.0 Key Species Considerations

The species identified for further consideration have been categorised into guilds in **Table 6**. By considering these species and their lifecycle needs, many other species are also inadvertently considered. The analysis below considers key lifecycle features for each guild of species in more detail, and assists in informing the subsequent 5-part test assessment.

Table 6 – Key Species Analysis

Guild / Species	Reason for Inclusion	Comment
Flora		
Eucalyptus glaucina	Proximity and abundance of local records	The species was not identified on site during field survey. Should it occur in the locality, it is unlikely to be subject to significant impacts as a result of the proposal.
Pterostylis chaetophora	Proximity and abundance of local records	The species was not identified on site during field survey. Should it occur in the locality, it is unlikely to be subject to significant impacts as a result of the proposal.
Birds		
Turquoise Parrot	Proximity of local records and potential foraging habitat	There are potential foraging habitats present on site. The proposal is unlikely to impact vegetation utilised by this species for more than occasional foraging.
Powerful Owl	Proximity of local records and potential foraging habitat	This species is more likely to be found in surrounding areas comprising open woodlands, forests and vegetation corridor. This species often hunts in open grassland and could use the site for occasional foraging. The proposed development is unlikely to impact the species
Glossy Black-Cockatoo	Proximity and abundance of local records	The species is more likely to be found in more suitable habitat for nesting and foraging. There are no feeding trees present on site.
Little Lorikeet	Proximity and abundance of local records Potential foraging habitat	This species may use the site for occasional foraging. As the proposal does not include removal of large trees, this species is unlikely to be impacted by the proposal.

Guild / Species	Reason for Inclusion	Comment
Grey-crowned Babbler	Abundance of local records and suitability of habitat	The species was not identified on site and adjacent areas of remnant vegetation are more likely to be preferred by the species.
Spotted Harrier	Proximity and abundance of local records	Local sightings are frequent and abundant within the surroundings of the Subject Site. Considering that the Subject Site is primarily co0mposed of exotic species and that the proposal does not impact nearby canopy trees, this species is unlikely to be impacted by the proposal.
Mammals		
Koala	Proximity and abundance of local records	No evidence of site use by Koala was observed on site. The trees present on site are not connected to any surrounding vegetation. As no trees will be removed, the proposed development is not likely to significantly impact vegetation potentially utilised by this species.
Grey-headed Flying Fox	Proximity and abundance of local records	Local sightings are frequent and abundant in the vicinity. The trees on sites offer potential roosting habitat, though without dense canopy, this species is unlikely to utilise the site.
Spotted-tailed Quoll	Proximity and abundance of local records	Local sightings are frequent and abundant in the vicinity. The site is an exposed paddock. As such, individuals may rarely cross over but are more likely to use more suitable habitats in the vicinity.
Microbat species including Yellow-bellied Sheathtail-bat, Eastern Coastal Free-tailed Bat, Southern Myotis and Greater Broad-nosed Bat	Proximity and abundance of local records Potentially suitable and marginal foraging habitat	Considering the wide foraging ranges of these species, there is potential for the species to fly through the site and forage in the proximity of canopy vegetation. Southern Myotis in particular may be found to forage over dams and wide watercourses.

9.0 Five-part Test Assessment

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

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

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

Under this proposal a water crossing will be built over the creek to the south, and the creek will be piped in this location. No large trees are proposed to be removed and the bridge will be located in an exotic-dominated vegetation zone subject to ongoing disturbance.

Eucalyptus glaucina* and *Pterostylis chaetophora

For both of these species, individuals were recorded approx. 20 km from the boundary of proposed earthworks. The species were not sighted during the survey and the potential for the species to occur within the Subject Site is minimal.

The extent of works which will impact upon the riparian zone are limited to a small and highly degraded vegetation zone to the south of the property. No threatened flora species were identified within the proposed impact area.

Therefore, it is not considered that the proposal will have an adverse effect on the life cycle of flora species such that a viable local population is likely to be placed at risk of extinction.

Turquoise parrot, Grey-crowned Babbler, Powerful Owl, Glossy Black-Cockatoo, Little Lorikeet, Spotted Harrier

There is potential for these species to temporarily utilise the site. Vegetation within the Subject Site, comprised of primarily exotic grasses with limited canopy trees, such that it offers limited roosting, nesting or foraging resources. Remnant vegetation in the proximity of the Subject Site, within the riparian corridor along the northwest boundary, offers better feeding and roosting habitat, and this is not subject to any proposed impacts. The area to be cleared for the water crossing only comprises a small vegetation patch primarily composed of exotic grasses and all nearby trees will be retained.

Given the above, it is highly unlikely that the development will have an adverse effect on the life cycle of these species such that the local populations of these threatened species would be placed at risk of extinction.

Spotted-Tailed Quoll

Although there is an abundance of past records in the surroundings of the Subject Site, no habitat features were found on site to suggest that the species may utilise the site to forage or roost. There was no evidence of the species presence found during the survey. Furthermore, no trees will be removed and the area of vegetation to be cleared is primarily composed of exotic understorey species.

Given the above, it is highly unlikely that the development will have an adverse effect on the life cycle of these species such that the local populations of these threatened species would be placed at risk of extinction.

Koala

Past records are primarily located in denser vegetation patches near the Subject Site. The potential for Koalas to utilise the site is minimal as none of the canopy trees present on site are connected to more suitable habitats. The riparian zone to be impacted does not comprise potentially suitable foraging habitat and it is unlikely the species will traverse the site between areas of fragmented vegetation. Furthermore, field survey did not find any evidence of site use by Koala.

As such, it is considered that the proposed development will not lead to such impacts that the species would be placed at risk of extinction.

Grey-headed Flying-fox

Despite abundance of local records, there is no evidence of site utilisation and no observations were recorded. No suitable roosting or foraging habitat occurs within the Subject Site.

As potential habitat on site is limited and likely to be unaffected, it is unlikely that the proposed development will place this species at risk of extinction.

Threatened microbat species

As described above, there is potential for Yellow-bellied Sheathtail-bat, Eastern Coastal Free-tailed Bat, Southern Myotis and Greater Broad-nosed Bat to forage over or in proximity of the Subject Site. However, the proposed development footprint presents negligible foraging value for these species, and the construction of a water crossing is unlikely to incur any adverse impacts on the lifecycle of the species.

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

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

Vegetation within the Subject Site has not been identified as being commensurate with a PCT or EEC.

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

As above.

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

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

The area of vegetation to be removed within the Subject Site is approximately 0.02ha and mostly comprises exotic grass species. The immediate locality and wider landscape contain significant areas of similar vegetation. Therefore, the small amount of native vegetation to be removed does not represent a significant extent of habitat in the wider locality.

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

A small pocket of primarily exotic vegetation (0.02ha) within the Subject Site would be affected by the proposal. This vegetation occurs upstream the creek and impacts to connectivity within the immediate locality would be minor. Removal of vegetation would not significantly fragment or isolate vegetation.

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

The habitat is not considered important to the survival of any threatened species, given the small amount of vegetation removal proposed, its low quality and the close proximity to areas of similar intact high-quality vegetation.

No threatened ecological communities will be impacted as part of the proposal.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared Area of Outstanding Biodiversity Value (either directly or indirectly)

No Area of Outstanding Biodiversity Value is present on site or in proximity of it.

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

The development has potential to contribute to the following KTPs:

- ***Anthropogenic climate change***

The proposed development is unlikely to contribute to the processes causing anthropogenic climate change in a significant way. A small area of exotic vegetation in cattle grazing grassland is proposed to be removed, which can act as a small carbon sink. However, removal of grasses unsuitable for cattle grazing and other grass maintenance processes are likely to reinstate a native element in the understory within the Subject Site, further mitigating the impact of the development on this KTP.

- ***Clearing of native vegetation***

The proposal will remove a small amount of exotic vegetation (0.02ha). Removal of this vegetation is not considered a significant contribution to this KTP.

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

The proposed development is not expected to amplify the existing presence of exotic weed species, as earthworks will be limited to the construction of a creek crossing and associated piping.

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

Controls including the disinfection of equipment before entering site should be undertaken to further minimise any risks of infection. Therefore, provided that appropriate hygiene measures are in place, the

works undertaken during the proposed development are not considered as likely to contribute to this KTP.

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

Controls including the disinfection of equipment before entering site should be undertaken to minimise any risks of infection. Provided such processes are implemented, it is not expected that earthworks undertaken during the construction phase would contribute significantly to this KTP.

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

There is some potential for development of the site to introduce, or increase the risk of, infection of frogs with amphibian chytrid which may lead to degraded health and loss of individuals within the local area. This risk is minor considering the extent of proposed impacts. Appropriate sediment controls are recommended to reduce the risk and spread of runoff into the surrounding drainage line which are to be put in place for all construction related activity to further limit such potential.

10.0 EPBC Act Assessment

A search was conducted in January 2023 for Matters of National Environmental Significance (MNES) as relevant to the *Environment Protection & Biodiversity Conservation Act 1999* (EPBC Act). The following MNES are considered in this assessment.

World Heritage Properties:

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

National Heritage Places:

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

Wetlands of International Significance (declared Ramsar wetlands):

The site is located upstream 40-50km from wetlands of international significance, namely the Hunter Estuary Wetlands. No impacts on the hydrology and ecology of the wetlands are expected as a result of the proposed development.

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 (TECs):

There are six (6) listed TECs known or assumed to occur within a 5km radius of the Subject Site:

- Central Hunter Valley eucalypt forest and woodland
- 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
- Lowland Rainforest of Subtropical Australia
- Subtropical eucalypt floodplain forest and woodland of the New South Wales North Coast and South East Queensland bioregions
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Vegetation within the Subject Site has not been identified as being commensurate with any State or Commonwealth listed TEC.

Threatened Species:

A total of 37 threatened species may occur in, or may relate to areas within 5 km of the Subject Site.

- No evidence of Grey-headed Flying Fox was found during the survey. No roost camps were identified on site.
- No evidence of site use by Koala was identified during the survey. There is an abundance of local records in the surroundings of the site. However, there is no connectivity to larger tracts of suitable habitat, which indicates that the species is unlikely to occur on site. The proposed development will have a negligible impact on native vegetation and related fauna habitat within the Study Area as all trees are to be retained and only primarily exotic grass vegetation will be removed. Therefore, no significant impact on Koala is expected as a result of the proposal.

Migratory Species:

A total of 14 migratory species may occur in, or may relate to areas within 5km of the Subject Site. The Subject Site is located substantially inland where it has been assessed that migratory birds are unlikely to occur or utilise the site.

EPBC Act Assessment Conclusion:

Consideration of the *EPBC Act* revealed that the proposed water crossing will not have a significant impact on MNES and a Referral is unlikely to be required.

11.0 State Environmental Planning Policy (Biodiversity and Conservation) 2021

SEPP (Biodiversity and Conservation) 2021 (*BC 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) 2020* was one SEPP that was consolidated within the *BC SEPP* under *Chapter 3 – Koala Habitat Protection 2020*. 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 *BC SEPP*, aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline.

The land which comprises the Subject Site has no approved Koala plan of management. According to the BC SEPP 2021, the policy applies as follows.

3.6 Step 1—Is the land potential Koala habitat?

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

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

(3) If the council is satisfied—

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

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

Two Koala sightings have been recorded within 2.5 km of the Subject Site in the last 18 years. One approx. 2.3km to the west in 2015 and one 2.4km to the northwest in 2018.

The two tree species identified in close proximity to the Subject Site are *Eucalyptus crebra* and *Corymbia maculata*, neither of which are listed as Koala use tree species in *Schedule 1 Feed Tree Species – Chapter 3*.

As neither of these trees are listed under Schedule 1, it is considered that the Subject Site does not constitute Potential Koala Habitat and no further assessment is required under Chapter 3 of th BC SEPP.

12.0 Recommendations

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

Riparian Assessment and Controlled Activity Approval

- The development as proposed will impact a small area of exotic-dominated vegetation within a riparian corridor. As the Subject Site is located within 40m of a mapped hydroline, a Riparian Assessment is recommended to confirm the presence of a watercourse, and a CAA may be required to be obtained from DPE-Water.

Water quality and hydrology

- An Erosion and Sedimentation Control Plan (ESCP) is required for the proposal following guidelines from the "Blue Book" (Landcom, 2004);
- Best practice erosion and sedimentation controls should be put in place to limit offsite movement of materials into the adjacent vegetation and creek; and
- Erosion and sedimentation controls should be checked daily and maintained in working order especially after rain events.

Protection of potentially occurring native fauna

- Prior to construction commencing, exclusion flagging tape and signage will be installed to delineate construction zone from retained vegetation.
- In the event that fauna is displaced during construction, it is recommended to contact local native fauna carers and ensure relocation to nearby retained habitat.

Protection and management of trees

- No machinery or material should be stored within retained vegetation or within the dripline of retained trees.
- Equipment should be cleaned thoroughly and disinfected before entering and exiting site to prevent weed and disease introduction such as *Phytophthora cinnamomi* (Root-rot fungus), *Puccinia psidii* (Myrtle Rust) and others

13.0 References

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Appendix A – Flora Species List

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

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

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

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

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

Introduced species are indicated by an asterisk “*”.

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

Family	*Scientific Name*	Common Name
Asparagaceae	*Eustrephus latifolius*	Wombat Berry
Asteraceae	*Onopordum acanthium**	Scotch Thistle
Asteraceae	*Senecio madagascariensis**	Fireweed
Asteraceae	*Taraxacum officinale**	Dandelion
Cyperaceae	*Schoenoplectus mucronatus*	
Cyperaceae	*Schoenoplectus validus*	
Fabaceae	*Glycine tabacina*	Variable Glycine
Fabaceae	*Trifolium spp.*	Clover
Geraniaceae	*Geranium homeanum*	
Hypericaceae	*Hypericum gramineum*	Small St John's Wort
Lamiaceae	*Plectranthus parviflorus*	Cockspur Flower
Malvaceae	*Sida rhombifolia**	Paddy's Lucerne
Myrtaceae	*Corymbia maculata*	Spotted Gum
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark
Onagraceae	*Ludwigia grandiflora*	Water Primrose
Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues
Poaceae	*Capillipedium spicigerum*	Scented-top Grass
Poaceae	*Cenchrus clandestinus**	Kikuyu Grass
Poaceae	*Cynodon dactylon*	Common Couch
Poaceae	*Echinochloa crusgalli**	Barnyard Grass
Poaceae	*Imperata cylindrica*	Blady Grass
Poaceae	*Panicum effusum*	Hairy Panic
Poaceae	*Paspalum distichum*	Water Couch
Poaceae	*Sporobolus africanus**	Parramatta Grass
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel
Rosaceae	*Rubus fruticosus**	Blackberry complex
Verbenaceae	*Verbena bonariensis**	Purpletop
Verbenaceae	*Verbena rigida**	Veined Verbena

Appendix B – Expected Fauna Species List

The following list includes fauna species that could be reasonably expected, within a 10 km radius, to occur on the Subject Site at some point, given site attributes and location.

“Threatened species listed under the BC Act or the EPBC Act are indicated in bold font.

Family Name	Scientific Name	Common Name	Surveyed Observations Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)
Amphibians			
Myobatrachidae	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	O
Myobatrachidae	*Uperoleia laevigata*	Smooth Toadlet	
Limnodynastidae	*Limnodynastes tasmaniensis*	Spotted Grass Frog	
Hylidae	*Litoria caerulea*	Green Tree Frog	
Hylidae	*Litoria fallax*	Eastern Dwarf Tree Frog	
Hylidae	*Litoria verreauxii*	Verreaux's Frog	
Bufonidae	*Rhinella marina*	Cane Toad	
Reptiles			
Agamidae	*Intellagama lesueurii*	Eastern Water Dragon	
Agamidae	*Pogona barbata*	Bearded Dragon	
Birds			
Megapodiidae	*Alectura lathami*	Australian Brush-turkey	
Phasianidae	*Synoicus ypsilophora*	Brown Quail	
Anatidae	*Anas castanea*	Chestnut Teal	
Anatidae	*Anas gracilis*	Grey Teal	
Anatidae	*Anas superciliosa*	Pacific Black Duck	
Anatidae	*Chenonetta jubata*	Australian Wood Duck	
Anatidae	*Cygnus atratus*	Black Swan	
Columbidae	*Chalcophaps indica*	Emerald Dove	
Columbidae	*Geopelia humeralis*	Bar-shouldered Dove	
Columbidae	*Leucosarcia melanoleuca*	Wonga Pigeon	
Columbidae	*Macropygia phasianella*	Brown Cuckoo-Dove	
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	

Family Name	Scientific Name	Common Name	Surveyed Observations Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)
Columbidae	*Spilopelia chinensis*	Spotted Turtle-Dove	
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant	
Ardeidae	*Ardea intermedia*	Intermediate Egret	
Ardeidae	*Ardea pacifica*	White-necked Heron	
Ardeidae	*Bubulcus ibis*	Cattle Egret	
Ardeidae	*Casmerodius modesta*	Eastern Great Egret	
Ardeidae	*Egretta novaehollandiae*	White-faced Heron	
Ardeidae	*Egretta sacra*	Eastern Reef Egret	
Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron	
Threskiornithidae	*Platalea regia*	Royal Spoonbill	
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	
Threskiornithidae	*Threskiornis moluccus*	Australian White Ibis	
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	
Accipitridae	*Aquila audax*	Wedge-tailed Eagle	
Accipitridae	*Circus approximans*	Swamp Harrier	
Accipitridae	*Elanus axillaris*	Black-shouldered Kite	
Accipitridae	***Haliaeetus leucogaster***	**White-bellied Sea-Eagle**	
Accipitridae	*Haliastur sphenurus*	Whistling Kite	
Falconidae	*Falco berigora*	Brown Falcon	
Falconidae	*Falco cenchroides cenchroides*	Nankeen Kestrel	
Falconidae	*Falco longipennis*	Australian Hobby	
Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	H
Rallidae	*Hypotaenidia philippensis*	Buff-banded Rail	
Rallidae	*Porphyrio porphyrio*	Purple Swamphen	
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt	
Charadriidae	*Vanellus miles*	Masked Lapwing	
Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	
Cacatuidae	*Cacatua sanguinea*	Little Corella	

Family Name	Scientific Name	Common Name	Surveyed Observations Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)
Cacatuidae	*Cacatua tenuirostris*	Long-billed Corella	
Cacatuidae	*Eolophus roseicapilla*	Galah	
Cacatuidae	*Zanda funereus*	Yellow-tailed Black-Cockatoo	
Psittacidae	*Alisterus scapularis*	Australian King-Parrot	
Psittacidae	***Glossopsitta pusilla***	**Little Lorikeet**	
Psittacidae	*Platycercus elegans*	Crimson Rosella	
Psittacidae	*Platycercus eximius*	Eastern Rosella	H
Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	
Cuculidae	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	
Cuculidae	*Cacomantis variolosus*	Brush Cuckoo	
Cuculidae	*Centropus phasianinus*	Pheasant Coucal	H
Cuculidae	*Chalcites lucidus*	Shining Bronze-Cuckoo	
Cuculidae	*Scythrops novaehollandiae*	Channel-billed Cuckoo	
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	
Alcedinidae	*Todiramphus sanctus*	Sacred Kingfisher	
Meropidae	*Merops ornatus*	Rainbow Bee-eater	
Coraciidae	*Eurystomus orientalis*	Dollarbird	
Climacteridae	*Cormobates leucophaea*	White-throated Treecreeper	
Ptilonorhynchidae	*Ptilonorhynchus violaceus*	Satin Bowerbird	
Ptilonorhynchidae	*Sericulus chrysocephalus*	Regent Bowerbird	
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	
Maluridae	*Malurus lamberti*	Variegated Fairy-wren	
Maluridae	*Stipiturus malachurus*	Southern Emu-wren	
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	
Acanthizidae	*Acanthiza lineata*	Striated Thornbill	
Acanthizidae	*Acanthiza nana*	Yellow Thornbill	
Acanthizidae	*Acanthiza pusilla*	Brown Thornbill	
Acanthizidae	*Acanthiza reguloides*	Buff-rumped Thornbill	

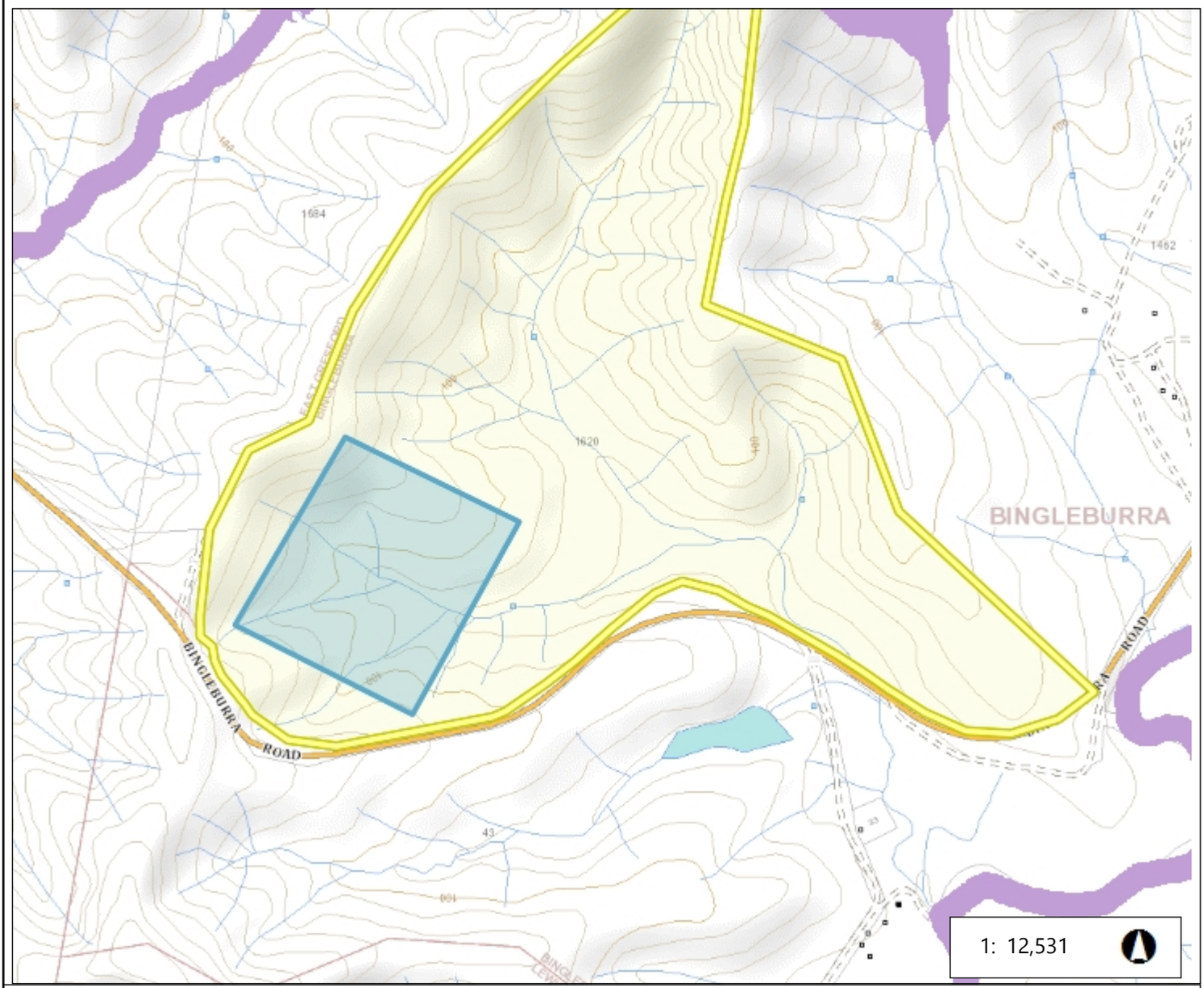
Family Name	Scientific Name	Common Name	Surveyed Observations Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)
Acanthizidae	*Gerygone mouki*	Brown Gerygone	
Acanthizidae	*Gerygone olivacea*	White-throated Gerygone	
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren	
Pardalotidae	*Pardalotus punctatus*	Spotted Pardalote	
Pardalotidae	*Pardalotus striatus*	Striated Pardalote	
Meliphagidae	*Acanthorhynchus tenuirostris*	Eastern Spinebill	
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Meliphagidae	*Caligavis chrysops*	Yellow-faced Honeyeater	
Meliphagidae	*Entomyzon cyanotis*	Blue-faced Honeyeater	
Meliphagidae	*Manorina melanocephala*	Noisy Miner	H
Meliphagidae	*Manorina melanophrys*	Bell Miner	
Meliphagidae	*Meliphaga lewinii*	Lewin's Honeyeater	
Meliphagidae	*Melithreptus lunatus*	White-naped Honeyeater	
Meliphagidae	*Philemon corniculatus*	Noisy Friarbird	
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	
Falcunculidae	*Falcunculus frontatus frontatus*	Eastern Shrike-tit	
Psophodidae	*Psophodes olivaceus*	Eastern Whipbird	
Campephagidae	*Coracina maxima*	Ground Cuckoo-shrike	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	
Campephagidae	*Lalage sueurii*	White-winged Triller	
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	
Pachycephalidae	*Pachycephala pectoralis*	Golden Whistler	
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler	
Oriolidae	*Oriolus sagittatus*	Olive-backed Oriole	
Oriolidae	*Sphecotheres vieilloti*	Australasian Figbird	
Artamidae	*Cracticus nigrogularis*	Pied Butcherbird	
Artamidae	*Cracticus torquatus*	Grey Butcherbird	
Artamidae	*Gymnorhina tibicen*	Australian Magpie	H

Family Name	Scientific Name	Common Name	Surveyed Observations Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)
Artamidae	*Strepera graculina*	Pied Currawong	
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail	
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	O/H
Rhipiduridae	*Rhipidura rufifrons*	Rufous Fantail	
Corvidae	*Corvus coronoides*	Australian Raven	O/H
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	O/H
Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	
Petroicidae	*Eopsaltria australis*	Eastern Yellow Robin	
Petroicidae	*Microeca fascinans*	Jacky Winter	
Cisticolidae	*Cisticola exilis*	Golden-headed Cisticola	
Acrocephalidae	*Acrocephalus australis*	Australian Reed-Warbler	H
Locustellidae	*Cincloramphus timoriensis*	Tawny Grassbird	
Locustellidae	*Poodytes gramineus*	Little Grassbird	
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	
Hirundinidae	*Petrochelidon ariel*	Fairy Martin	
Hirundinidae	*Petrochelidon nigricans*	Tree Martin	
Sturnidae	*Acridotheres tristis*	Common Myna	
Sturnidae	*Sturnus vulgaris*	Common Starling	
Zosteropidae	*Zosterops lateralis*	Silvereye	
Dicaeidae	*Dicaeum hirundinaceum*	Mistletoebird	
Estrildidae	*Neochmia temporalis*	Red-browed Finch	
Estrildidae	***Stagonopleura guttata***	**Diamond Firetail**	
Estrildidae	*Stizoptera bichenovii*	Double-barred Finch	
Passeridae	*Passer domesticus*	House Sparrow	
Motacillidae	*Anthus novaeseelandiae*	Australian Pipit	
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna	
Mammals			
Dasyuridae	***Dasyurus maculatus***	**Spotted-tailed Quoll**	
Phascolarctidae	***Phascolarctos cinereus***	**Koala**	

Family Name	Scientific Name	Common Name	Surveyed Observations Observed (O), Heard (H), Scat (S), Marking (M), Track (T), Nest (N), Burrow (B)
Vombatidae	*Vombatus ursinus*	Bare-nosed Wombat	
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum	
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	
Macropodidae	*Notamacropus rufogriseus*	Red-necked Wallaby	
Macropodidae	*Osphranter robustus*	Common Wallaroo	
Macropodidae	*Wallabia bicolor*	Swamp Wallaby	
Pteropodidae	***Pteropus poliocephalus***	**Grey-headed Flying-fox**	
Molossidae	***Micronomus norfolkensis***	**Eastern Coastal Free-tailed Bat**	
Vespertilionidae	***Falsistrellus tasmaniensis***	**Eastern False Pipistrelle**	
Vespertilionidae	***Myotis macropus***	**Southern Myotis**	
Vespertilionidae	***Scoteanax rueppellii***	**Greater Broad-nosed Bat**	
Miniopteridae	***Miniopterus australis***	**Little Bent-winged Bat**	
Miniopteridae	***Miniopterus orianae oceanensis***	**Large Bent-winged Bat**	
Canidae	*Canis familiaris*	Dog	
Canidae	*Canis lupus*	Dingo, domestic dog	
Canidae	*Vulpes vulpes*	Fox	
Felidae	*Felis catus*	Cat	
Leporidae	*Oryctolagus cuniculus*	Rabbit	

Appendix C – BOSET report

Biodiversity Values Map



636.6 0 318.28 636.6 Metres

WGS_1984_Web_Mercator_Auxiliary_Sphere

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

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Legend

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

Notes

Biodiversity Values Map and Threshold Report

Results Summary

Date of Calculation	01/02/2023 3:46 PM	**BDAR Required***
Total Digitised Area	129,193.2 sqm	
Minimum Lot Size Method	LEP	
Minimum Lot Size 10,000sqm = 1ha	600,000 sqm	
Area Clearing Threshold 10,000sqm = 1ha	10,000 sqm	
Area clearing trigger Area of native vegetation cleared	Unknown #	Unknown #
Biodiversity values map trigger Impact on biodiversity values map(not including values added within the last 90 days)?	no	no
Date of the 90 day Expiry	N/A	

*If BDAR required has:

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

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

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

Disclaimer

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

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

Acknowledgement

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

Signature_____ Date:01/02/2023 03:46 PM

Appendix D – Site Photographs

Above Crossing location, looking east
Below: Crossing location, looking west

Above: *Crinia signifera* in creek adjacent to Subject Site
Below: Landscape view of Study Area

Appendix E – Author CVs

Edouard Loisance

Curriculum Vitae

Edouard works with AEP in the role of Ecologist. He completed a Diploma of Conservation and Land Management and holds a Master in Management. He has extensive experience in business development and corporate strategy consulting, including report writing, and started specialising in ecology in 2018, after acquiring experience in bush regeneration and fauna observation. He is now working towards gaining BAM Accreditation.

Qualifications

- Diploma of Conservation and Land Management, Tocal Agricultural College, Paterson, NSW (2021)
- Master of Management, ESCP Europe Business School, Paris, France (2007)

Further Education & Training

- NSW Driver's Licence.
- Current Senior First Aid.

Fields of Competence

- Field assessment including: targeted fauna and flora surveys, BAM plots, Koala Spot Assessment Technique (SAT) surveys and tree surveys
- 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, comprehensive Koala plans of management and SEPP 44 and SEPP Koala Habitat Protection assessments
- Bushfire threat analysis and reporting
- Advanced GIS user (MapInfo)

Relevant Employment History

2018 – Present	**Lead Ecology Works Manager** Anderson Environment & Planning, Newcastle
2014 - 2018	**Lead Consultant** Quantium, Sydney
2012 - 2014	**Account Director** Catalina Marketing, Leeds UK
2011 – 2012	**Business Development Director** Catalina Marketing, Paris France
2009 - 2011	**Account Executive** Procter and Gamble, Paris France

2005 - 2006 **Assistant Business Manager**
Procter and Gamble, Weybridge UK

Volunteer Experience

- Bush Regeneration Volunteer, Hunter Wetlands Centre Australia, Shortland
- Bush Regeneration Volunteer, National Parks and Wildlife Service jointly with Blue Mountains City Council (various sites in Wentworth Falls and Blackheath, NSW)

Samuel V. Rayfield

Curriculum Vitae

Samuel works with AEP in the role of Ecologist. He graduated with a Bachelor of Communication and is working towards completion of a Diploma in Conservation and Ecosystems Management. Samuel has previously worked in ecological restoration and land management before coming to AEP. Samuel has experience in a variety of environmental work, both paid and unpaid, including flora and fauna terrestrial and aquatic field surveys, weed management, reporting, GIS and mapping and habitat restoration. His background in ecological surveying projects and growing flora knowledge and experience is utilised in a diverse array of applications in his current role.

Qualifications

- Working at Heights Certificate
- First Aid & CPR Cert – HLTAID003
- Driver Licence – Class C, unrestricted
- National Police Check
- Working with Children Check

Further Education & Training

2020	**Introduction to Anatomy & Physiology; Individual Determinants of Health** Latrobe University
2017	**Diploma in Conservation and Land Management** Hunter TAFE – partial completion
2012 –2016	**Bachelor of Communication** University of Newcastle

Relevant Employment History

2022 – Present	**Ecologist** Anderson Environment and Planning, Newcastle
2020	**Bush Regenerator** Litoria Ecological Restoration Services
2018 – 2020	**Bush Regenerator** Toolijooa Environmental Restoration
2016 – 2017	**Bush Regenerator** Newcastle City Council

SEBASTIEN DOLEAC

Curriculum Vitae

Qualifications

- B. Science (Biology), M. Conservation Biology

Further Education & Training

- Master of Research, Macquarie University, 2022
- Master of Conservation Biology

  Global Leadership program, Macquarie University, 2020-2022.
- Master of Environment, Macquarie University, 2020-2021
- Study Abroad, University of Newcastle, 2019-2020
- Bachelor of Science (Biology), La Rochelle University, FRANCE, 2017 - 2020

Ecological Field Experience

- Vegetation Assessment
- Water quality assessment
- Scientific communication
- Project management and budgeting

Relevant Employment History

2022-Present **Ecologist**
Anderson Environment and Planning

Feb 2022 – Current **Researcher**
Macquarie University

- Investigated the efficiency of microbial amendments on three Australian native plant species to improve direct-seeding restoration work.
- Conducted a glasshouse experiment; extracted and analysed data.
- Managed, directed and budgeted the project from start to end.
- Adapted project to research challenges.

Jun 2021 – Nov 2021 **Research Intern**
Macquarie University

- Assisted researchers with data collection and data analysis.
- Composed a scientific report formatted for publication.
- Conferenced on diverse aspects of the projects.

Nov 2020 – Current **Volunteer Project Officer**
Hunter Region Landcare Network

- Advised and Counselled on major regional projects across the public and private sectors including regenerative farming projects and Aboriginal culture
- Collaborated with farmers, landcarers and local Aboriginal Land Councils on cross-cultural projects.
- Led and wrote Fauna Features to communicate scientific facts about Hunter Region native fauna to the general public.
- Conceptualised riparian vegetation maps on GIS software to identify vegetation communities of the Hunter Region
- Analysed bushfire impacts on the Hunter vegetation using NDVI and NBR on GIS software.
- Guided local communities on local endemic plant selection during the TOCAL Field Day.
- Extracted information on the past vegetation ecology and Aboriginal livelihood of the Hunter Region by reviewing archives and Aboriginal Dreaming Stories.
- Interviewed members of the Wollotuka Institute on their connections to the land for a major project.
- Participated to bush regeneration workshops

Volunteer Experience

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