Biodiversity Certification Assessment Report (BCAR)

Proposed rezoning of Lot 23 DP 1244350 505 Minmi Road, Fletcher

Prepared for

Barr Planning

Final V6 / November 2023

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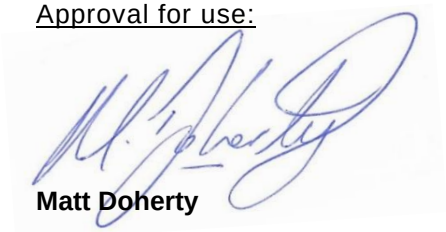
DOCUMENT STATUS

Project Particulars			
Project Name	BCAR: Lot 23 DP1244350 505 Minmi Road, Fletcher		
Job Number	19082		
Client	Barr Planning Pty Ltd		
Status	Final		
Version	**Date**	**Prepared by**	**Details**
V1	21-09-2022	MW/SB/MD	Draft for client review
V2	04-04-2023	MW/MD/CP	Final
V3	26-04-2023	MD/CP	Final
V4	01-08-2023	MW/MD	Final addressing RFI
V5	31-10-2023	MW/CP/MD	Final
V6	21-11-2023	ES/MD	Final addressing agency comments

Approval for use:



Matt Doherty

21 November 2023

I Matthew Doherty (Accredited BAM Assessor # BAAS17044) certify this report has been prepared on the basis of the requirements of (and information provided under) the Biodiversity Assessment Method (BAM) 2020.

EXECUTIVE SUMMARY

MJD Environmental has been engaged by Barr Planning to prepare a Certification Assessment Report (BCAR) over the land of Lot 23 DP 1244350, 505 Minmi Rd, Fletcher, NSW. The preparation of the BCAR to address ecological matters as they pertain to the proposed rezoning of the Lot. The proposed rezoning (which will form a Planning Proposal) will comprise of a future residential area zoned as R2 Low Density Residential (12.70 ha) and the establishment of C2 Environmental Conservation land (13.54 ha). The entirety of the site is assessed herein for the purposes of the biocertification of the land.

The proposed rezoning covers approximately 26.23 ha which chiefly contains native vegetation across the site, with the exception of a number of access roads.

The subject land was not mapped on the *Biodiversity Values Map* (BVM) at the time of report preparation; however, the proposal exceeds the area clearing threshold associated with the Minimum Lot Size (MLS) of the Lot. Therefore, the proposal triggers assessment under the Biodiversity Assessment Method (BAM) and entry into the Biodiversity Offset Scheme (BOS) as per Section 7.1.1 (b) of the BC Regulations (2017).

Application of the BAM was used to the establish biodiversity impacts of the proposal inclusive of impacts to native vegetation and threatened entities (species and communities) within the locality listed under the BC Act, requiring that an accredited assessor (AA) prepare and submit a BCAR to the approval consent authority. This is a non-strategic Biocertification requiring submission to the Minister within the Department of Planning and Environment, as per Part 8 of the BC Regulations (2017) in conjunction with the planning proposal. The BCAR requires a biodiversity certification strategy as per Section 12 of BAM 2020.

The proposed subject land is zoned as C4 Environmental Living and is currently a vacant bush lot containing unsealed roads, fences, rubbish and native vegetation. The land has undergone historic clearing and grazing evident by the young age cohorts of trees, fences, weed invasion and disturbed vegetation. The overall native woody vegetation is in moderate to poor condition comprising of good species composition and structure, however substantial cover of the High Threat Exotic (HTE) species *Lantana camara* within the gullies.

A total of three Plant Community Types (PCTs) were identified within the subject land:

- 1589 – *Spotted Gum – Broad-leaved Mahogany – Grey Gum grass – shrub open forest on Coastal Lowlands of the Central Coast*
- 1590 – *Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest* commensurate with the BC Act listed Endangered Ecological Community (EEC) *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*
- 1619 – *Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia heathy open forest of coastal lowlands*

In addition, an assessment was undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Assessment concluded that no actions associated with the proposal are likely to have a significant impact on Matters of National Environmental Significance.

Impact Avoidance & Mitigation

A package of avoidance and mitigation measures have been described in this BCAR associated with the project. The rezoning incorporates the establishment of two areas of C2 Environmental Conservation, including a large parcel within the core of the subject land, and the extension of C2 land with the south of the Lot. Site selection for the proposal is based on the site being historically identified for future residential investigation and remains to align with future planning values of The Hunter Regional Plan 2041 and Greater Newcastle Metropolitan 2036. This includes the avoidance of important wildlife corridors within the region.

As such, the proposed rezoning has been endorsed by the Hunter Central Coast Regional Planning Panel, deeming the proposal to have both strategic and site specific merit. All measures have been incorporated into the design (avoidance) in the first instance with mitigation measures assessed for the construction phases of the project.

Impact Analysis

The proposal will result in the following impacts and required offsets as calculated using the BAM-C Calculator:

Ecosystem Credits

- 1.20 ha of PCT 1589 requiring 46 ecosystem credits
- 10.31 ha of PCT 1590 (TEC) requiring 394 ecosystem credits
- 0.94 ha of PCT 1619 requiring 20 ecosystem credits

Species Credits

- *Myotis macropus* (Southern Myotis) requiring 51 credits
- *Petaurus norfolcensis* (Squirrel Glider) requiring 466 credits

There is no requirement to offset:

- 0.65 ha of exotic vegetation and non-vegetated areas (access tracks)

Biodiversity Certification Strategy

As per section 12 BAM 2020, the BCAR strategies outlines the conservation measures proposed to offset impacts to the proposed biocertification. As the BCAR is non-strategic, items 1 – 3 do not relate to this proposal. No Biodiversity credits will be created as a component of this proposal and therefore the credit value of conservation measures applied not assessed.

The current method to retire credits for the proposal is likely to be via payment into the Biodiversity Conservation Fund or retirement of credits available on the market.

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GLOSSARY OF TERMS AND ABBREVIATIONS

Term/ Abbreviation	Meaning
BAM	Biodiversity Assessment Method
BDAR	Biodiversity Development Assessment Report
BC Act	Biodiversity Conservation Act 2016
BS Act	Biosecurity Act 2016
CoN	City of Newcastle
Council	City of Newcastle
DoEE	Commonwealth Department of the Environment & Energy
DPIE	NSW Department of Planning Industry and Environment
DPI Water	NSW Department of Primary Industries – Water
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
GDE	Groundwater Dependant Ecosystem
ha	hectare
LGA	Local Government Area
LLS Act	Local Land Services Act
MNES	Matters of National Environmental Significance
OEH	Former NSW Office of Environment and Heritage
PCT	Plant Community Type
SAT	Spot Analysis Technique

1 Introduction

MJD Environmental has been engaged by Barr Planning to prepare a Biodiversity Certification Assessment Report (BCAR) over the land of Lot 23 in DP 1244350, 505 Minmi Rd, Fletcher. The preparation of the BCAR is to address ecological matters as they pertain to the proposed rezoning of the Lot. The proposed rezoning will comprise of R2 Low Residential zones, subject to future development, and retained C2 Environmental Conservation zones.

See **Figure 11** for the proposed rezoning of the Lot and **Appendix A** for the draft development design of the BCAR. The indicative lot layout will be updated upon approval of the proposed rezoning boundaries.

1.1 Description of Proposal

Project Context

The proposal seeks the approval of a proposed rezoning (by way of a Planning Proposal) over the land of Lot 23 in DP 1244350 (as described above). The intended rezoning will facilitate the future development of the area to be zoned as R2 Low Residential, and areas to be retained as C2 Environmental Conservation.

Biodiversity certification of the land allows for subsequent development proposals in alignment with the rezoning to be assessed without a site by site assessment of biodiversity impacts as potential biodiversity impacts have been addressed. The entirety of the site is assessed herein for the purposes of the biocertification of the land.

Refer to **Figure 1** for a site and location map and **Figure 11** for a plan of the proposed rezoning.

1.2 Legislative Context

Consideration of the proposal has been made in accordance with the following State, Federal and local Acts and Policies:

Commonwealth:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).*

NSW:

- *Biodiversity Assessment Method (BAM) (DPIE 2020a).*
- *Biodiversity Conservation Act 2016 (NSW) (BC Act).*
- *Biodiversity Conservation Regulation 2017 (NSW) (BC Regulation).*
- *Biosecurity Act 2015 (NSW).*
- *Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act).*
- *Local Land Services Act 2013 (NSW) (LLS Act).*
- *State Environmental Planning Policy (Biodiversity and Conservation) 2021.*
- *State Environmental Planning Policy (Planning Systems) 2021*
- *State Environmental Planning Policy (Resilience and Hazards) 2021*
- *Water Management Act 2000 (NSW) (WM Act).*

Local:

- *Newcastle Local Environmental Plan (NLEP) 2012*
- *Newcastle Development Control Plan (DCP) 2012*

Under the EP&A Act 1979 development proposals must be assessed via application of Part 7 of the Biodiversity Conservation Act 2016 (BC Act). As the proponent is submitting a Planning Proposal to inform a rezoning over the land in alignment with current Newcastle Local Environmental Plan 2012 (NLEP 2012), the assessment of potential impacts resultant from the eventual development that the

rezoning would allow, is assessed as per the requirements of the BC Act. In relation to biodiversity, potential impacts are addressed under Part 8 of the Act, Biodiversity Certification of land.

As part of this proposal, biodiversity impacts are required to be assessed as per the BAM (2020) with the preparation of a Biodiversity Certification Assessment Report (BCAR), which is submitted to the respective Ministers and assessed in conjunction with the planning proposal. Biodiversity Certification can be either standard or strategic; with strategic biocertification requiring additional conservation measures be included within the planning proposal, as determined by the Minister. In addition to assessment of Biodiversity impacts under the BC Act, consideration of Social and Economic impacts resultant from the proposal has been made in alignment with the purpose of the Act (see **Appendix J** for full assessment).

As the following assessment of biodiversity impacts over the land is in conjunction with the planning proposal for a rezoning of the Lot 23 in DP 1244350, 505 Minmi Rd, Fletcher, a BCAR has been prepared herein outlining the conservation measures to offset the impacts of the proposed certification inclusive of the requirements as outlined in Section 12 of BAM 2020 Operation Manual. The proposal has not been declared strategic by the Minister, therefore standard biocertification of the land is sought. As a result, items 1 – 3 of section 12, biodiversity certification strategy proposed to offset the impacts of the proposed certification do not apply beyond the retirement of the biodiversity credit liability of the zoned areas that will enable vegetation clearing (i.e., not inclusive of the C2 zones).

The land is currently zoned solely C4 Environmental Living. The planning proposal associated with the intended rezoning will put forward parcels of R2 Low Density Residential within the southern and eastern portions of the lot, with a parcel of C2 Environmental Conservation spanning south-east to north-west across the core of the lot, additionally a C2 parcel will exist within the very south of the lot.

The proposed rezoning has been considered by the Hunter Central Coast Planning Panel. The panel have endorsed the proposal acknowledging the strategic merit of the site to create local and regional opportunities while incorporating the retention of conservation values. Subsequently, the planning proposal was submitted to the Department of Planning and Environment (DPE) for a Gateway determination. Gateway determination was issued 13 January 2023 with conditions. This BCAR addresses Condition 3 of the Gateway determination and the subsequent recommendations raised by the Biodiversity and Conservation Division. The BCAR demonstrates that the proposal has been considered from an economic, social and environmental impact perspective and that the zoning boundary establishes an ecologically sustainable development consistent with the purpose of the BC Act 2016.

1.3 Aims & Objectives

The subject land is not mapped on the OEH *Biodiversity Values Map;* however, the proposal will exceed the area clearing threshold, which is one of the triggers for determining whether the Biodiversity Offsets Scheme applies to the proposed impact.

The threshold for clearing is dependent on the minimum lot size applicable to the land under the relevant Local Environmental Plan (Refer to **Table 1**).

Table 1: Clearing Thresholds (BC Act Regulation 2020)

Minimum lot size associated with the property	Threshold for clearing, above which the BAM offsets scheme apply.
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

The threshold applies to all native vegetation clearing associated with a proposal, regardless of whether this clearing is across multiple lots. In the case of a subdivision, the proposed clearing must include all future clearing likely to be required for the intended use of the land after it is subdivided.

The Lot has a minimum lot size of 40 ha and as clearing of up to 12.45 ha of native vegetation is proposed, triggering the area clearing threshold (>1 ha) and in turn, entry into the Biodiversity Offsets Scheme (BOS).

For the purposes of the biodiversity offsets scheme, a biodiversity certification assessment report (BCAR) is prepared by an accredited person in relation to the proposed biodiversity certification of land under Part 8, that:

a) Assesses in accordance with the biodiversity assessment method the biodiversity values of the land proposed for biodiversity certification, and;
b) Assesses in accordance with that method the impacts on biodiversity values of the actions to which the biodiversity offsets scheme applies on the land proposed for biodiversity certification, and specifies the number and class of biodiversity credits to be retired to offset those impacts as determined in accordance with that method, and;
c) that specifies other proposed conservation measures on or in respect of other land to offset those impacts on biodiversity values and their value (in terms of biodiversity credits) determined in accordance with that method.

This BCAR is based on the application of the NSW Biodiversity Assessment Methodology 2020 (BAM), which provides a framework for assessing development impact on biodiversity. A two-stage investigation path was performed in accordance with the BAM as listed below:

Stage 1 – Biodiversity Assessment; and

Stage 2 – Impact Assessment.

This report sets out the minimum BAM assessment requirements for the preparation of a BCAR in Appendix K of the BAM (2020).

In addition, preliminary assessment was also undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.4 Site Particulars

The following nomenclature has been used in this report (Refer to **Figure 1**):

- Subject Land – Refers to the lot, as the lot is subject to the rezoning.
- Impact Boundary – Refers to the area proposed to be zoned as R2 and access roads required in the proposed C2.

Locality	The subject land is located in Fletcher, NSW
Land Title	Lot 23 DP 1244350
LGA	City of Newcastle
Area	Subject Land – 26.23 ha Impact Boundary – 13.10 ha
Zoning	The subject land is currently zoned C4 – Environmental Living
Boundaries	The subject land is situated in the recently established residential precinct of the Fletcher village with residential lots under construction adjoining the subject land to the east and north, vacant land zoned as R2 - Low Density Residential to the west and to the south by C2 – Environmental Conservation zoned lands. The subject land is bound by frontage (north) to Minmi Road.
Current Land Use	The lot is currently a vacant bush block, comprising native vegetation, unsealed roads, fences, rubbish dumps and motorcycle/bicycle tracks.
Topography	The highest point of subject land is located on the eastern boundary at 53 m ASL. The land falls steeply from the east (~20 m ASL) until it reaches a creekline (28 m ASL) and elevates again towards the west to 38 m ASL.

1.5 Qualifications & Licencing

Qualifications

This BCAR has been prepared by Maddy Walsh (BAAS# 21010) under the guidance of Matt Doherty (BAAS# 17044) accredited BAM Assessor.

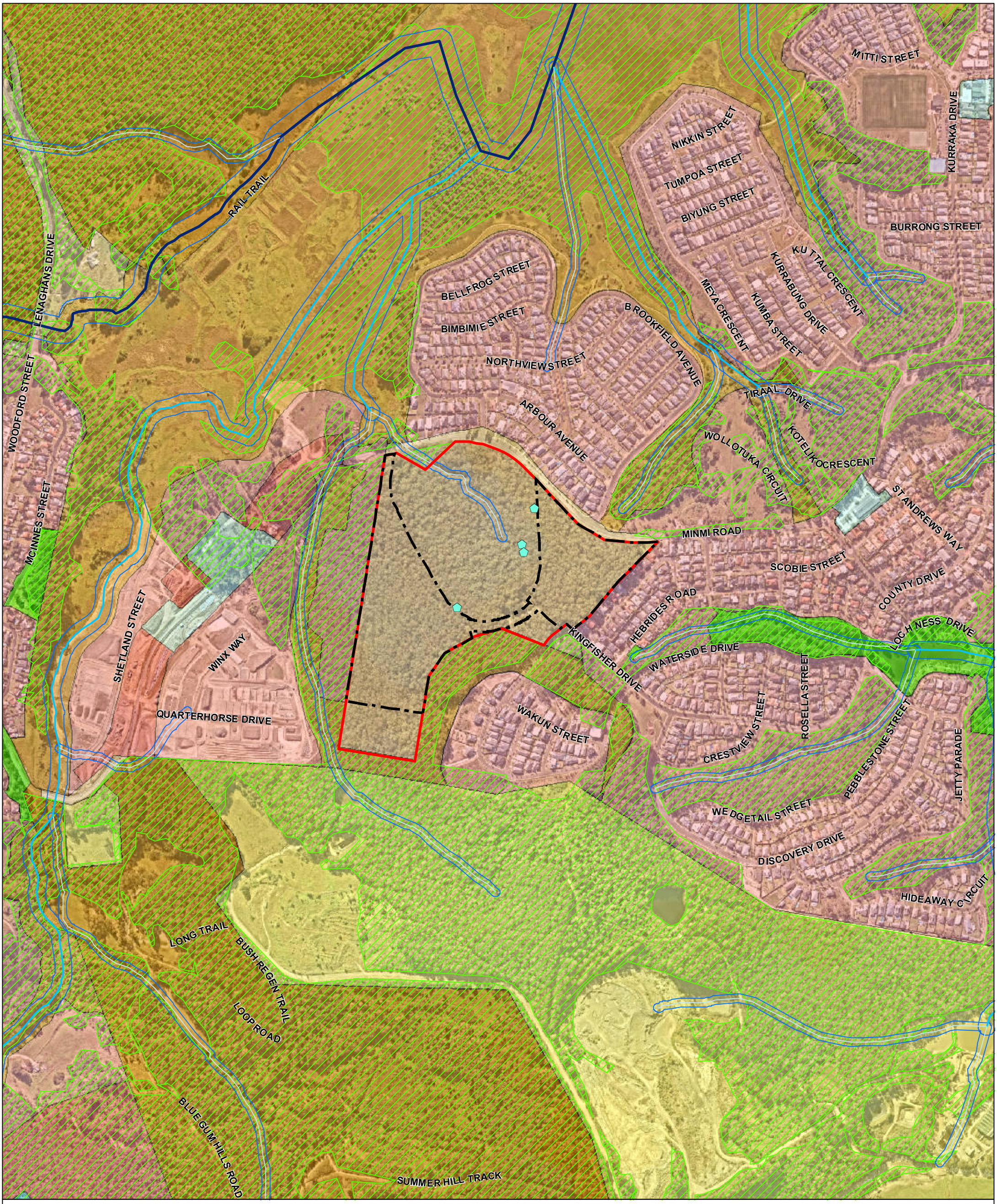
Field work for the BCAR was carried out by Ali Bragg, Adam Cavallaro, Alexander Jeffery, Bret Stewart, Coral Pearce, Chris Spraggon, Josh Smart, Laura Smith, Mathew Grassi, Max Manion-Sharrock, Maddy Walsh, Nixon Jowett, Phoebe Smith, Ross Duncan, Robert Fay, Simone-Louise Yasui, Stephanie Sheehy, and Tom Fletcher of MJD Environmental (Aust) Pty Ltd.

Refer to **Appendix N** for personnel qualifications.

Licencing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101684 (Valid 31 March 2024).
- Animal Research Authority (Trim File No: 16/170) issued by NSW Government – Regional NSW on recommendation of Animal Care and Ethics Committee (Valid 8 February 2027).



505 MINMI RD, FLETCHER

FIGURE 1: SITE AND LOCATION

0 137.5 275 550

Meters

1:8,000

Legend

- Subject Land
- Impact Boundary
- Native Vegetation
- Rocky Outcrops

Watercourse

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- Riparian Buffers

Land Use Zoning

- B1
- B2
- C1
- C2
- C4
- R2
- R3
- RE1
- SP2

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

STAGE 1 BIODIVERSITY ASSESSMENT

2 Landscape Context

2.1 Landscape Features

The following section provides a description of the landscape features within the subject land, a 1,500 m buffer surrounding the subject land, as outlined in Section 3 of the BAM (2020).

2.1.1 Interim Biogeographic Regionalisation of Australia (IBRA)

Bioregion

The subject land occurs wholly within the Sydney Basin Bioregion. The Sydney Basin Bioregion comprises of Mesozoic sandstones and shales; dissected plateaus: forest, woodlands and heaths: The soils are primarily skeletal soils, sands and podzolics (Thackway & Cresswell 1995).

This Bioregion borders NSW North Coast to the north: Nandewar and Brigalow Belt south and the South Eastern Highlands in the south.

Subregion

The subject land occurs wholly within the Hunter subregion.

2.1.2 Mitchell Landscapes

The subject land occurs wholly within *Gosford – Cooranbong Coastal Slopes,* Mitchell Landscape Coastal fall of the Sydney Basin, rolling hills and sandstone plateau outliers of Triassic Narrabeen sandstones, extensive rock outcrop and low cliffs along ridge margins, general elevation 0 to 75 m. Texture-contrast soils on lithic sandstones and shales. Loamy sand alluvium along creeks. Organic sand and mud in lagoons and swamps. Open forest and woodland of Smooth-barked Apple (*Angophora costata*), Red Bloodwood (*Corymbia gummifera*), Brown Stringybark *(Eucalyptus capitellata*), Sydney Peppermint *(Eucalyptus piperita*), Spotted Gum *(Corymbia maculata*), Bastard Mahogany *(Eucalyptus carnea*), Northern Grey Ironbark *(Eucalyptus siderophloia*) and Grey Gum *(Eucalyptus punctata*) on hills and slopes. Small areas of closed forest with; Turpentine (*Syncarpia glomulifera*), Lilly Pilly (*Acmena smithii*), Mountain Cedar Wattle (*Acacia elata*), Coachwood (*Ceratopetalum apetalum*), Sassafras (*Doryphora sassafras*) and Water Gum (*Tristaniopsis laurina*) in gullies under high escarpments Prickly-leaved Tea-tree (*Melaleuca stypheloides*) and other shrubs with Swamp Mahogany *(Eucalyptus robusta*), Swamp Oak (*Casuarina glauca*), sedges and Common Reed (*Phragmites australis*) on swampy creek flats. Coastal heath subject to salt spray on headlands.

2.1.3 Rivers, Streams, Estuaries and Wetlands

The subject land is located within the Hunter River catchment in the Hunter region. The subject land is located approximately 7 km south west of the Hunter River and approximately 1.5 km south west of the beginning of the Hexham Swamp Nature Reserve between Minmi and Maryland.

The hydrology of the subject land is typified by a single ephemeral 1st order stream. The stream runs in a south-north direction near the northern boundary of the subject land which eventually connects with Back Creek in the southern section of Hexham Swamp. An additional 1st order stream is mapped within the south western corner of the subject land, however a site inspection and ground truthing confirmed this stream is located outside of the subject land.

A single permanent waterbody is present along the mapped 1st order stream within the north of the site. The waterbody was barely present during preliminary biodiversity assessments of 2019, however evolved into a more prominent waterbody with the drought relief experience across eastern NSW in early 2020. Additionally, several small ephemeral waterbodies were encountered during period of extensive rain. This included several deep depressions, likely caused from past disturbance event, that held water up to ~2 m wide and ~1 m deep.

No wetlands or estuaries are within the subject land. Hexham Swamp and Shortland Wetlands start ~1.5 km north of the subject land.

2.1.4 Ground Water Dependent Ecosystems

Groundwater plays an important ecological role in directly and indirectly supporting terrestrial and aquatic ecosystems. Groundwater sustains terrestrial and aquatic ecosystems by supporting vegetation and providing discharge to channels, lacustrine and palustrine wetlands, and both the estuarine and marine environment.

The degree of groundwater dependence of ecosystems in terms of three broad categories:

- **Non-dependent ecosystems** that occur mostly in recharge areas and have no connection with groundwater.
- **Facultative GDEs** that require groundwater in some locations but not in others, particularly where an alternative source of water can be accessed to maintain ecological function. Minor changes to the groundwater regime in facultative GDEs with proportional or opportunistic groundwater dependence may not have any adverse impacts but these ecosystems can be damaged or destroyed if a lack of access to groundwater is prolonged.
- **Obligate GDEs** that are restricted to locations of groundwater discharge and ecosystems located within aquifers (e.g., subterranean cave and stygofauna communities (Kuginis et al. 2012). Aquifer ecosystems are inherently groundwater dependent (Bureau of Meteorology, 2017).

Groundwater dependant ecosystems have been classified into seven types under two broad categories as follows (Kuginis et al. 2012):

- Subsurface ecosystems – Underground ecosystems
- Karst systems and caves (limestone geology)
- Subsurface aquifer (phreatic) ecosystems
- Baseflow streams (hyporheic or subsurface component)
- Surface ecosystems – Above ground ecosystems
- Groundwater dependent wetlands
- Baseflow surface streams (surface/free-water component)
- Estuarine and near shore marine ecosystems
- Groundwater dependent terrestrial ecosystems; dependent on subsurface groundwater (phreatophytic).

The Bureau of Meteorology Atlas of Groundwater Dependant Ecosystems (GDEs) for the Hunter River catchment has identified areas of low and moderate terrestrial GDEs within the subject land. No areas of aquatic GDEs were identified within the subject land.

The project does not include the extraction of groundwater; however, contamination from construction operations, could impact on the quality of groundwater if adequate mitigation measures are not taken. See **Section 12** for recommended mitigation measures.

2.1.5 Connectivity

The subject land is a part of a large continuous patch of vegetation that currently provides fragmented connectivity in a north-south direction. The patch continues south to contain Blue Gum Hill Regional Park and further west to incorporate Sugarloaf State Conservation Area. However, connectivity of the patch is limited by the presence of the arterial roads the M1 Freeway and Hunter Expressway. Connectivity to the north of the site is fragmented by Minmi Road, this connectivity is generally limited to the isolated canopy trees present and open unmanaged pastures. This semi-hostile connection continues north to Hexham Swamp, of which is a part of a large wetland complex to include Shortland Wetlands and Kooragang Nature Reserve. The land parcel exists as the very eastern extent of connectivity east-west, with the residential estate of Fletcher present directly east of the site.

2.1.6 Areas of Geological significance and soil hazard features

No karsts, caves or cliffs or other areas of geological significance occur in or adjacent to the subject land.

Several rocky outcrops exist within the subject land, these features were inspected for potential threatened species habitat. The rocky outcrops contained small shallow crevices suitable for small reptiles and mammals. These identified habitat features were taken into consideration during threatened species assessments.

A review of the Acid Sulphate Soils (ASS) Risk mapping (Naylor et al 1998) records indicate the site contains predominantly Class 5 ASS over the subject land, with a small area of Class 3 ASS present within a small area in the north-west.

2.1.7 Areas of Outstanding Biodiversity Value

There are no Areas of Outstanding Biodiversity Values within the 1,500 m buffer or in the general locality of the subject land.

2.2 Site Context

The site context was assessed for the subject land via desktop assessment of Aerial Photograph Interpretation (API) using GIS Software and site assessment. Site context considerations included native vegetation cover and patch size in accordance with section 3.2 of the BAM (2020).

2.2.1 Native Vegetation Cover

The native vegetation cover of the subject land and 1,500 m buffer was carried out by API of high-quality aerial photography using GIS Software (Map Info), and local vegetation mapping data Lower Hunter Vegetation Mapping (Cockerill et al 2013).

Native vegetation cover has been assessed as 55%.

Refer to **Figure 2**.

2.2.2 Patch Size

A patch is defined in the BAM as; *an area of intact native vegetation that occurs on the subject land. The patch may extend onto adjoining land beyond the footprint of the subject land, and for woody ecosystems, includes native vegetation separated by ≤100 metres from the next area of intact native vegetation. For non-woody vegetation, this gap is reduced to ≤30 metres.* Patch size for each vegetation zone (in this case one vegetation zone) is assigned to one of the following classes: <5 ha, 5-<25 ha, 25 - <100 ha, and ≥100 ha. Patch size for the proposed subject land has been assessed using the methods outlined above in Section 4.3.2 and has been determined to be ≥100 ha.

505 MINMI RD, FLETCHER

FIGURE 2: NATIVE VEGETATION EXTENT

Legend

- Subject Land
- Impact Boundary
- 1500m Buffer from Site
- Native Vegetation

Watercourse

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 10m Buffer
- 20m Buffer
- 30m Buffer

0 230 460 920

Meters

1:13,500

IBRA Region: Sydney Basin
Subregion: Hunter

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

3 Native Vegetation

3.1 Preliminary Vegetation Review

A desktop analysis of vegetation within the subject land and its surrounds were informed by large-scale vegetation mapping projects and aerial photography to determine potential Plant Community Types (PCTs) occurring within the Study Area, they include:

- *Lower Hunter and Central Coast Regional Vegetation Mapping* (DPE 2010);
- GIS analysis including - Aerial Photograph Interpretation (API) and consultation of topographic map (Scale 1:25,000) layers for the Study Area; and
- OEH VIS Classification Database.

3.2 Methodology: Field Assessment

All vegetation survey methods have been carried in accordance with the following documentation and methods:

- *Biodiversity Assessment Methodology (BAM):* Department of Planning, Industry and Environment (DPIE), October 2020;
- *Biodiversity Assessment Method Operational Manual - Stage 1* Department of Planning, Industry and Environment (DPIE), December 2020; and
- *Biodiversity Assessment Method Operational Manual – Stage 2* Department of Planning, Industry and Environment (DPIE), September 2019.
- *NSW Guide to Surveying Threatened Plants and Their Habitats* (DPIE), April 2020.

In addition, all Fauna survey methods have been carried out in accordance with the following documentation and methods:

- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, Working Draft* (DEC 2004); and
- *NSW Survey Guide for Threatened Frogs* – A guide for the survey of threatened frogs and their habitats for Biodiversity Assessment Method (DPIE 2020); and
- *NSW Threatened Reptiles* Biodiversity Assessment Method Survey guide (DPE 2022); and
- *Survey guidelines for Australia's threatened reptiles* - Guidelines for detecting reptiles listed as threatened under the EPBC Act; and
- *Department of the Environment 2010, Survey guidelines for Australia's threatened birds:* Guidelines for detecting birds listed as threatened under the EPBC Act. Commonwealth of Australia Barton, ACT; and
- *'Species credit' threatened bats and their habitats* - NSW survey guide for the Biodiversity Assessment Method (OEH 2018); and
- Threatened Biodiversity Data Collection (TBDC)

3.2.1 Field Survey

Field assessment of vegetation to determine Plant Community Types (PCTs) present, determine Vegetation Zone (VZ) delineation. Preliminary BAM floristic plots were carried out on 13th, 15th, 20th, 27th & 28th November 2019 by Phoebe Smith, Adam Cavallaro and Bret Stewart. These surveys were carried out in accordance with the Biodiversity Assessment Methodology (BAM 2017). Owing to the

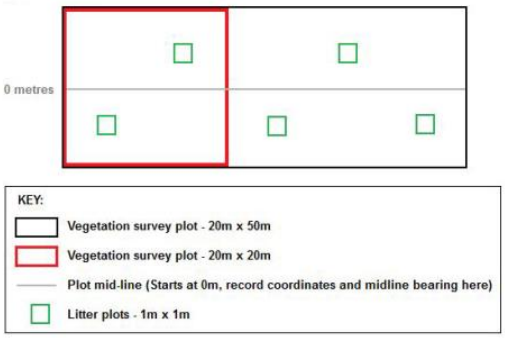
longevity of the proposal, preliminary surveys including BAM Plots and targeted surveys were undertaken in line with the BAM 2017. Survey effort within this period, and subsequent data, has been reviewed to ensure that the assessment meets the requirements as per the BAM 2020 and associated survey guidelines.

Additional vegetation field assessments were carried out on the 30th of November and the 3rd of December 2021 by Maddy Walsh and Robert Fay. This consisted of a revision of vegetation zones due to a change in the presence of Hight Threat Exotics (HTE), including revisiting each plot to updated cover of HTEs. Additionally, further BAM plots were conducted to incorporate an additional vegetation zone owing to the changes in conditions. The assessment is in accordance with the Biodiversity Assessment Methodology (BAM 2020).

A total of 12 BAM plots were carried out across the subject land. The following methods were used to inform the vegetation survey associated with the BCAR:

The following methods were used to inform the vegetation survey associated with the BCAR:

- Broad vegetation identification, delineation and stratification into vegetation zones carried out by detailed random meander methods (Cropper 1993);
- Collection of 12 plots based full floristic data as per Table 3 BAM Operations Manual 1 (2020), recording the following:
    - Identification of all flora species to genus where identification attributes were present
    - Composition, Structure attributes within 20x20 m plot; and
    - function attributes within the 20X50 m plot
- Collection of subject land landscape attributes that included, landform, aspect, soil type, detailed descriptions of the vegetation condition, current land use and the current impacts.



Plot Layout (BAM Satge 1 Operational Manual Dec 2020)

3.2.2 Hollow Bearing Tree Survey

As per the BAM, a hollow bearing tree survey was undertaken (December 2019/April 2022) across the subject land with the following information collected:

- Location (GPS);
- Tree species;
- Tree DBH;
- Presences of hollows (including potential hollows) and class;
- Habitat suitability for large forest owls and large parrots; and
- Any observational information.

Results of the surveys are shown in **Figure 3** and **Appendix D**.

3.3 Results

3.3.1 Native Vegetation Extent

The subject land is 26.23 ha in size, which 25.47 ha was observed as native vegetation and 0.76 ha of exotic/non-vegetation (unsealed roads/cleared lands). The extent of native vegetation has been interpreted using API and ground truthing during field survey works (Refer to **Figure 3**).

The vegetation within the subject land appears to have experienced partial historical clearing, likely for the harvesting of Mine pit props. Additionally, the land appears have experience grazing pressure suggested by the modified or absent midstratum and weed presence. The historic land use has resulted in the modification of the structure of native vegetation within the subject land comprising large patches of the exotic species *Lantana camara*, numerous unsealed roads, bike tracks, large rubbish dumps, and largely intact canopy cover with vegetation communities ranging from moderate to poor condition.

Identification of PCTs within the subject land were determined using:

- Occurrence within the Sydney IBRA bioregion;
- Vegetation formation and class:
- landscape position; and
- dominant species noted during field data collected from the full floristic plots/transects established in accordance.

Three PCTs were identified within the subject land:

- PCT 1589 - *Spotted Gum – Broad-leaved Mahogany – Grey Gum grass – shrub open forest on Coastal Lowlands of the Central Coast*.
- PCT 1590 - *Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest*
- PCT 1619 - *Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia heathy open forest of coastal lowlands*

A total of 129 plant species were identified within 12 plots comprising 124 native species and 5 exotic species. The results of the plot field data and a flora species list can be found in **Appendix B**.

Of these, the following Threatened Ecological Community (TEC) was determined to be present based on state determination (see **Table 2**):

- BC Act listed Endangered: *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*

PCTs are delineated into a total of seven vegetation zones (VZ) driven primarily by condition; be it from burn history, access roads or weed invasion. Complete VZ descriptions are included in **Section 3.3.2.**

Table 2 Plant Community Types and associated Threatened Ecological Communities

Plant Community Type (PCT)	Threatened Ecological Community Association	
1589 - *The Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast*	BC Act Listed Endangered: *Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion.*	The PCT is not commensurate with the TEC determination as the study area is not within, or close to the Pittwater LGA.
1590 - *Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest*	BC Act Listed Endangered: *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*	Commensurate with the BC Act listed EEC *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*
1619 - The *Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia heathy open forest of coastal lowlands*	-	-

3.3.2 Vegetation Description

VZ1

PCT 1589 - *Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast* (Moderate)	
Area within Subject Land	0.58 ha
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass)
Vegetation Class	Hunter Macleay Dry Sclerophyll Forests
Floristic Description	*The Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast* is the second dominant plant community observed within the Study Area. This PCT is categorised into three condition classes; this moderate condition variant is characterised by a low number of high threat weeds, some disturbance due to past land use, and containing a moderate number of mature and hollow bearing trees. The canopy is generally dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus acmenoides* (White Mahogany) and *Eucalyptus punctata* (Grey Gum) with *Eucalyptus umbra* (Broad-leaved White Mahogany), *Eucalyptus fibrosa* (Broad-leaved Ironbark), *Angophora costata* (Smooth-barked Apple) and *Eucalyptus siderophloia* (Grey Ironbark) as co-dominants. Juvenile individual tree species *Notelaea longifolia* (Large Mock-olive), *Brachychiton populneus* (Kurrajong) and *Clerodendrum tomentosum* (Hairy Clerodendrum) were also recorded within the VZ. The midstorey comprises a mixture of shrub species dominated by, *Daviesia ulicifolia* (Gorse Bitter-pea), *Breynia oblongifolia* (Coffee Bush) and *Bursaria spinosa* (Sweet Bursaria) with *Acacia falcata* (Hickory Wattle), *Polyscias sambucifolia* (Elderberry Panax), *Acacia ulicifolia* (Prickly Moses), and *Denhamia silvestris* (Narrow-leaved Orangebark) with *Melaleuca nodosa* (Prickly-leaved Paperbark) and *Melaleuca stypheloides* (Prickly-leaved Tea Tree) occurring within the gullies. Generally, the groundcover comprises a mixture of native grass species, dominated by *Entolasia stricta* (Wiry Panic), *Themeda triandra* (Kangaroo Grass), *Imperata cylindrica* (Blady Grass) with *Poa affinis, Lomandra filiformis* subsp. *coriacea, Lomandra confertifolia* (Mat-rush), *Lomandra longifolia* (Spiny-headed Mat-rush), *Lepidosperma laterale, Lomandra filiformis* subsp. *filiformis, Rytidosperma pallidum* (Silvertop Wallaby Grass) and *Microlaena stipoides* subsp. *stipoides* (Weeping Grass) with *Oplismenus aemulus* (Australian Basket Grass), *Oplismenus imbecillis* (Creeping Beard Grass), *Gahnia clarkei* (Tall Saw-sedge) and *Carex appressa* (Tall Sedge) occurring within the gullies. The main high threat exotic species observed was *Lantana camara* (Lantana), with *Senna pendula* var. *glabrata* (Cassia) and *Asparagus aethiopicus* (Ground Asparagus) also observed within the VZ.
Condition	Moderate
Structure	The canopy trees range from juvenile to semi-mature age cohorts. Good canopy cover exists within the VZ resulting in approximately 58-69% foliage cover over the entire area. The midstory is reasonably sparse due to the presence of grazers, generally between 3-5% foliage cover through the VZ. Grass growth forms are highly prevalent within this PCT occurring as 50-80% foliage cover. Vegetation had a structure condition score of >70 and comparatively with an average high threat weed cover of 8.6%.

PCT 1589 - *Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast* (Moderate)	
Justification for PCT Selection	The PCT assignment of 1589 to the vegetation within the subject land is based on the follow key attributes: ▪ Key diagnostic species within all stratums (*Corymbia maculata, Eucalyptus umbra, Eucalyptus punctata, Daviesia ulicifolia, Breynia oblongifolia, Notelaea longifolia*, *Pandorea pandorana, Billardiera scandens*, *Themeda triandra, Poa affinis*, *Rytidosperma pallidum, Imperata cylindrica*, *Lomandra confertifolia, Dianella caerulea* var. *producta, Lomandra longifolia* and *Glycine clandestina*) The subject land is located within the Hunter IBRA sub-region and Gosford – Cooranbong Coastal Slopes NSW Landscape (Mitchell 2002). This landscape has an association with the lithology noted in the PCT description.
Status	BC Act: *EEC - Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion* PCT 1589 is associated with Listed BC Act, Endangered: *Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion*. In accordance with the Final determination for the EEC, the vegetation community within the subject land contains diagnostic dominant canopy and mid stratum species, including canopy species *Corymbia maculata* and *Eucalyptus paniculata.* The subject land occurs on Permian lithic sandstones and shale soils within the Newcastle LGA. As per the Final Determination, the community has been recorded within the LGAs of Pittwater and Gosford, however, may be present in other LGAs located within the Sydney Basin Bioregion. Bell & Stable (2012), a key study describing the characteristics of the community, note the environmental characteristics to be an important component of the community. That being the locations on shale-derived soils form Narrabeen series geology on the shores and associated low hills of Broken Bay and Pittwater. The study compares the similarities of the community to communities containing a similar floristic composition in neighbouring LGAs, showing them to be analogous. Furthermore, the EEC has been delineated into 'Dry' & 'Moist' variants, demonstrating that the community its highly variable with the environmental changes even within the restricted population. Owing to the common occurrence of *Corymbia maculata-Eucalyptus paniculata* communities within the Sydney IBRA Bioregion and the broad floristic description supplied within the Final Determination, it is feasible to deem the geographical location as a key indicator of the EEC. As such, PCT 1589 within the subject land is not commensurate with the EEC.
	EPBC Act: Not listed

PCT 1589 - *Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast* (Moderate)

VZ 2

PCT 1589 - *Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast* (*A. costata* Variant)	
Area within Subject Land	0.21 ha
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass)
Vegetation Class	Hunter Macleay Dry Sclerophyll Forests
Floristic Description	This variation in PCT 1589 is defined by a shift in co-dominance of canopy species recorded in VZ 1 to contain *Angophora costata* with by *Corymbia maculata* (Spotted Gum), *Eucalyptus acmenoides* (White Mahogany), *Corymbia gummifera* (Red Bloodwood), *Eucalyptus umbra* (Broad-leaved White Mahogany), *Eucalyptus globoidea* (White Stringybark) and *Eucalyptus fibrosa* (Broad-leaved Ironbark). This VZ is a transitional zone between PCT 1589 and PCT 1619 within the south of the site. The midstorey is of similar composition however contains *Pultenaea euchila* (Orange Pultenaea), *Pultenaea spinosa* (Spiny Bush-pea) and *Daviesia squarrosa*, where *Daviesia ulicifolia* (Gorse Bitter-pea) was absent. Ground cover, vines and scramblers is comparable to groundcover described for VZ1. HTE *Lantana camara* (Lantana) is present within small abundances through the VZ.
Condition	Moderate
Structure	All structural floristic layers are relatively comparable to that of VZ1
Justification for PCT Selection	The vegetation assigned to VZ6 - 1589_Moderate_A_costata comprises a dominance of *A. costata*, unlike other VZs within this PCT. The structure, composition and function scores are relatively similar to the other moderate condition variant within this PCT. This VZ is a transition zone to PCT 1619 and PCT 1589, however floristic composition and structure is more consistent with PCT 1589 than PCT 1619.
Status	BC Act: *EEC – Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion* See justification of VZ1. The PCT is not considered commensurate with the EEC.
	EPBC Act: Not listed

VZ 3

PCT 1589 – *Spotted Gum – Broad-leaved Mahogany – Grey Gum grass – shrub open forest on Coastal Lowlands of the Central Coast* (Low)	
Area within Subject Land	0.40 ha
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass)
Vegetation Class	Hunter Macleay Dry Sclerophyll Forests
Floristic Description	Delineation of VZ3 is driven primarily by disturbance, characterised by areas dominated by HTE *Lantana camara*, predominantly within the gullies/creeklines. Canopy floristics are comparable to that of VZ1. The high cover of *Lantana camara* has resulted in a suppression of native midstorey species, in addition to historic grazing. Ground cover comprises predominantly of native grass and forbs, compositionally matching the description in VZ1.
Condition	Disturbed
Structure	The VZ contains an intact mature canopy. The cover of the midstory is dominated by *Lantana camara* (50-65% foliage cover) and contain a sparse native shrub cover. The high HTE cover has subsequently supressed ground cover, sparser than that of VZ1.
Justification for PCT Selection	PCT determination is driven primarily by the continuation of canopy between VZ1, therefore this VZ has been assigned the same PCT as part of the contiguous patch.
Status	BC Act: *EEC - Pittwater and Wagstaffe Spotted Gum Forest in the Sydney Basin Bioregion* See justification of VZ1. The PCT is not considered commensurate with the EEC.
	EPBC Act: Not listed

VZ 4

PCT 1590 - *Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest* (Moderate)	
Area within Subject Land	8.21 ha
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation Class	Hunter-Macleay Dry Sclerophyll Forests
Floristic Description	The *Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest* is the dominant plant community observed within the subject land. The canopy is dominated by *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Eucalyptus umbra* (Broad-leaved White Mahogany) with *Eucalyptus acmenoides* (White Mahogany) and *Eucalyptus punctata* (Grey Gum) as co-dominants. *Eucalyptus resinifera* subsp. *resinifera* (Red Mahogany) becomes co-dominant with *Corymbia maculata* closer to the creekline. *Notelaea longifolia* (Large Mock-olive) and *Glochidion ferdinandi* var. *ferdinandi* (Cheese Tree) were observed in low numbers but consistent throughout the VZ as saplings or juvenile age cohorts. Other tree species observed in low numbers include *Alphitonia excelsa* (Red Ash) and *Eucalyptus globoidea* (White Stringybark). The midstorey comprises a mixture of shrub species dominated by *Bursaria spinosa* (Sweet Bursaria), *Pultenaea euchila* (Orange Pultenaea), *Acacia ulicifolia* (Prickly Moses), *Daviesia ulicifolia* (Gorse Bitter-pea) and *Breynia oblongifolia* (Coffee Bush) with *Daviesia squarrosa, Phyllanthus hirtellus* (Thyme Spurge), *Hibbertia empetrifolia* subsp. *empetrifolia* and *Hibbertia aspera* (Rough Guinea Flower). Generally, the groundcover comprises a mixture of native grass species, dominated by *Entolasia stricta* (Wiry Panic) followed by *Themeda triandra* (Kangaroo Grass). Other grass species occurring consistently throughout this PCT include *Lomandra confertifolia* (Mat-rush), *Lomandra multiflora* (Many-flowered Mat-rush), *Rytidosperma pallidum* (Silvertop Wallaby Grass), *Poa affinis, Microlaena stipoides* var. *stipoides* (Weeping Grass), *Aristida vagans* (Three-awned Grass), *Lomandra obliqua, Lepidosperma cf. laterale* and *Rytidosperma bipartitum.* Vines and twiners are also scarce within the VZ, including species *Pandorea pandorana* (Wonga Wonga Vine), *Kennedia prostrata* (Running Postman), *Eustrephus latifolius* (Wombat Berry), *Geitonoplesium cymosum* (Scrambling Lily), *Hardenbergia violacea* (Purple Coral Pea), *Glycine clandestina* (Twining Glycine), *Billardiera scandens* (Hairy Apple Berry) and *Hibbertia scandens* (Climbing Guinea Flower). Exotic weeds were sparse throughout the zone, through the HTE species *Lantana camara* (Lantana) and *Asparagus aethiopicus* (Asparagus Fern) were both observed.
Condition	Moderate
Structure	The canopy trees range from juvenile to mature age cohorts. Good canopy cover exists within the VZ resulting in approximately >50% foliage cover over the entire area. The midstorey was patchy across the VZ, varying between 3-87% foliage cover. Grass growth forms were highly prevalent within the VZ occurring as ~80% foliage cover. Vegetation had a structure condition score of >70 and comparatively with an average high threat weed cover of 1.5%.

PCT 1590 - *Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest* (Moderate)	
Justification for PCT Selection	The PCT assignment of 1590 to the vegetation within the subject land is based on the follow key attributes: ▪ Key diagnostic species within all stratums *Corymbia maculata, Eucalyptus umbra, Eucalyptus fibrosa*, *Bursaria spinosa, Daviesia ulicifolia*, *Breynia oblongifolia, Leucopogon juniperinus, Pandorea pandorana* and *Lepidosperma laterale*. The subject land is located within the Hunter IBRA sub-region and Gosford – Cooranbong Coastal Slopes NSW Landscape (Mitchell 2002). This landscape has an association with the lithology noted in the PCT description.
Status	BC Act: *EEC Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* This VZ was found to commensurate with the EEC. This was based off the community assemblage being in line with that of the assemblage listed within the determination, the subject land being in the appropriate geographical region and on the appropriate substrate.
	EPBC Act: Not Listed
	

VZ 5

PCT 1590 - *Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest* (Low)	
Area within Subject Land	0.37 ha
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation Class	Hunter-Macleay Dry Sclerophyll Forests
Floristic Description	VZ5 is a disturbed variant of VZ4, specifically due to the high prevalence of *Lantana camara* throughout the zone. The canopy, midstorey and ground cover is comparable to that of VZ4. The groundcover contains slightly lower presence of native grass and forb species due to disturbance events. Additionally, *Asparagus aethiopicus* (Asparagus Fern) was observed in low abundances.
Condition	Disturbed
Structure	The canopy consists of a predominantly mature cohort, comparable to the cover of VZ4. The midstorey is reasonably sparse due to the presence of grazers and the presence of *Lantana camara,* which consisted of ~50% foliage cover throughout. Grass growth forms were highly prevalent within the VZ occurring as ~80% foliage cover. Vegetation had a structure condition score of >70.
Justification for PCT Selection	PCT determination is driven primarily by the continuation of canopy between VZ4 and characteristic described in the determination of VZ4.
Status	BC Act: *EEC Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* This VZ was found to commensurate with the EEC. This was based off the community assemblage being in line with that of the assemblage listed within the determination, the subject land being in the appropriate geographical region and on the appropriate substrate. The determination does not limit the community based on the presence of HTE cover.
	EPBC Act: Not Listed

VZ 6

PCT 1590 - *Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest* (Low_*M.nodosa* Variant)	
Area within Subject Land	1.73 ha
Vegetation Formation	Dry Sclerophyll Forests (Shrub/grass sub-formation)
Vegetation Class	Hunter-Macleay Dry Sclerophyll Forests
Floristic Description	This VZ is characterised by a lower species composition and structure due to the dominance and dense cover of *Melaleuca nodosa*, most likely a symptom of historic disturbance such as land clearing which is evident by the young age cohort of canopy species present within this zone. Canopy species *Corymbia maculata* (Spotted Gum), *Eucalyptus fibrosa* (Broad-leaved Ironbark) and *Eucalyptus umbra* (Broad-leaved White Mahogany) with *Eucalyptus acmenoides* (White Mahogany) and *Eucalyptus punctata* (Grey Gum) are present throughout the VZ. Floristically, the midstratum and ground cover are comparable to VZ5, however due to the high abundance of *Melaleuca nodosa* (Prickly-leaved Paperbark), the cover is sparser.
Condition	Disturbed
Structure	The canopy consists of a predominantly mature cohort, comparable to the cover of VZ4 and VZ5. The midstorey was high due to the presence of *M. nodosa,* which consisted of ~70% foliage cover throughout. Grass growth forms were low due to the high presence of shrub cover occurring as ~30% foliage cover. Vegetation had a structure condition score of 63.5.
Justification for PCT Selection	PCT determination is driven primarily by the continuation of canopy between VZ4 and characteristic described in the determination of VZ4.
Status	BC Act: *EEC Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* This VZ was found to commensurate with the EEC. This was based off the community assemblage being in line with that of the assemblage listed within the determination, the subject land being in the appropriate geographical region and on the appropriate substrate. Although the VZ contained high cover of *M. nodosa* within the midstorey, Canopy species and other midstorey species were in line with the assemblage for the TEC. The determination does not limit the community based on the presence of HTE cover.
	EPBC Act: Not Listed

VZ 7

PCT 1619 - *Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands* (Low)	
Area within Subject Land	0.94 ha
Vegetation Formation	Dry Sclerophyll Forests (Shrubby)
Vegetation Class	Sydney Coastal Dry Sclerophyll Forests
Floristic Description	Overall, the canopy is dominated by *Angophora costata* (Smooth-barked Apple) and *Corymbia gummifera* (Red Bloodwood) with *Eucalyptus umbra* (Broad-leaved White Mahogany). *Notelaea longifolia* (Large Mock-olive) was observed in low numbers but consistent throughout this PCT as saplings. The canopy trees range from young to semi mature to mature age cohorts. The midstorey comprises a mixture of shrub species dominated by *Leptospermum polygalifolium* (Tantoon) followed by *Daviesia ulicifolia* (Gorse Bitter-pea), *Pultenaea euchila* (Orange Pultenaea), *Acacia ulicifolia* (Prickly Moses), *Pultenaea villosa* (Hairy Bush-pea), *Acacia falcata* (Hickory Wattle), *Phyllanthus hirtellus* (Thyme Spurge), *Bursaria spinosa* (Sweet Bursaria), *Hibbertia aspera, Hibbertia empetrifolia* and *Persoonia linearis* (Narrow-leaved Geebung). The shrub layer is quite dense throughout this PCT with a 24% foliage cover. Generally, the groundcover comprises a mixture of native grass species, dominated by *Entolasia stricta* (Wiry Panic) followed by *Rytidosperma pallidum* (Silvertop Wallaby Grass) and *Themeda triandra* (Kangaroo Grass). Other grass species occurring consistently throughout this PCT include *Lomandra obliqua, Lomandra multiflora* (Many-flowered Mat-rush), *Aristida vagans* (Three-awned Grass) and *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush). Vines and twiners are also scarce within this PCT, native species present include: *Hibbertia scandens* (Climbing Guinea Flower), *Pandorea pandorana* (Wonga Wonga Vine), *Kennedia prostrata* (Running Postman), *Glycine clandestina* (Twining Glycine), *Billardiera scandens* (Hairy Apple Berry) and *Clematis aristata* (Old Man's Beard). *Lantana camara* (Lantana) occurs in low numbers throughout this PCT.
Condition	Disturbed
Structure	The vegetation assigned to VZ 7 comprises a dominance of *Angophora costata* and *Corymbia gummifera*, where Ironbark species were notably absent, and the understorey becomes heathy. This zone is highly disturbed due to the presence of numerous roads fragmenting this PCT and the low number of existing mature trees. The midstorey was sparse due to disturbance experience by the VZ which consisted of ~25% foliage cover throughout. Grass growth forms is moderate occurring as ~65% foliage cover. Vegetation had a structure condition score of 65. HTE *Lantana camara* was present in small numbers (1% foliage cover).
Justification for PCT Selection	The PCT assignment of 1619 to the vegetation within the subject land is based on the follow key attributes: • Key diagnostic species within all stratums The subject land is located within the Hunter IBRA sub-region and Gosford – Cooranbong Coastal Slopes NSW Landscape (Mitchell 2002). This landscape has an association with the lithology noted in the PCT description
Status	BC Act: Not listed EPBC Act: Not Listed

PCT 1619 - *Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands* (Low)

505 MINMI RD, FLETCHER

FIGURE 3: PLANT COMMUNITY TYPES AND VEGETATION ZONES

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- BAM Plot
- Hollow Bearing Tree
- Hollow Bearing Stag
- Stag

Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated
- Lower Hunter Spotted Gum Ironbark Forest

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

4 Vegetation Integrity Assessment

Native vegetation identified as PCT 1589, 1590 and 1619 within the subject land are categorised into seven vegetation zones (VZs) based on the general condition of vegetation. Observation of distinct change or variation in the vegetation based on general attributes such as vegetation age, observable disturbance (past and present), presence of exotic species and structural difference such as stratum presence/absence were used to delineate the subject land into a VZ with the remaining area identified as non-native vegetation.

The subject land has been delineated into seven VZs:

- VZ 1: 1589_Moderate
- VZ 2: 1589_Moderate (*A. costata*)
- VZ 3: 1589_Low
- VZ 4: 1590_Moderate
- VZ 5: 1590_Low
- VZ 6: 1590_Low (*M. nodosa*)
- VZ 7: 1619_Low

The following table provides a brief description of the vegetation zones justifying the categorisation.

A total of 12 full floristic BAM plots were conducted. The number of plots carried out are in accordance with the minimum required plots per area as outlined in **Table 3** of the BAM (2020).

4.1 Vegetation Integrity Assessment results

A total of 129 plant species were identified within ten plots comprising 124 native species and five exotic species. The results of the plot field data and a flora species list can be found in **Appendix B and C.**

The plot data from the vegetation plot was entered into the BAM-C calculator and the results of the vegetation integrity assessment is summarised in **Table 3**.

Table 3 Vegetation Integrity Results

Vegetation Zone	No. of Plots	Composition condition Score	Structure Condition Score	Function Condition score	Vegetation Integrity Score (V.I)
VZ1_1589_Moderate	2	85.3	72.7	88.7	81.9
VZ2_1589_Moderate (*A. costata*)	1	68.7	77.1	50.5	64.4
VZ3_1589_Low	2	93.4	59.8	69.4	72.9
VZ4_1590_Moderate	4	75.5	90.3	80.4	81.9
VZ5_1590_Low	1	67.6	79.7	79.3	75.3
VZ6_1590_Low (*M. nodosa*)	1	65.1	66.5	30.1	50.7
VZ7_1619_Low	1	62	63.6	45.4	56.4

As outlined in section 9.2.1 of the BAM biodiversity offset credits are required for native vegetation where the vegetation integrity score:

- is ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or
- is ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community: or
- is ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

5 Threatened Species

5.1 Desktop Assessment

A review of threatened species information was undertaken to provide context and understanding of biodiversity values occurring within the subject land. Information reviewed included:

- Online database searches involving a 10-km buffer around the subject land to provide potentially occurring threatened flora and fauna and migratory species under both the BC Act and EPBC Act:
    - NSW Bionet (accessed November 2019 and continually during BCAR production)
    - Commonwealth Protected Matters of National Significance search tool (accessed 28 June 2022)
- BioNet Vegetation Classification – Threatened species associated with known PCTs to occur within the subject land.

5.2 Ecosystem Credit Species

Ecosystem Credit Species are reliably predicted to occur by vegetation surrogates and landscape features. An assessment of the habitat suitability for each predicted species was undertaken to determine the presences or potential utilisation of the subject land as part of their home range. These species are presented in **Table 4**.

Table 4 Ecosystem Credit Species

Scientific Name	Common Name	BC Act	EPBC Act	PCT 1589	PCT 1590	PCT 1619	Habitat Present
**Anthochaera phrygia*	Regent Honeyeater	CE	CE	X	X		Yes
**Callocephalon fimbriatum*	Gang-gang Cockatoo	V		X	X	X	Yes
**Calyptorhynchus lathami*	Glossy Black Cockatoo	V		X	X	X	Yes
Chthonicola sagittata	Speckled Warbler	V		X	X	X	Yes
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		X	X	X	Yes
Daphoenositta chrysoptera	Varied Sittella	V		X	X	X	Yes
Dasyurus maculatus	Spotted-tailed Quoll	V	E	X	X	X	Yes
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		X	X	X	Yes

Scientific Name	Common Name	BC Act	EPBC Act	PCT 1589	PCT 1590	PCT 1619	Habitat Present
Glossopsitta pusilla	Little Lorikeet	V		X	X	X	Yes
Grantiella picta	Painted Honeyeater	V	V	X	X	X	Yes
**Haliaeetus leucogaster*	White-bellied Sea-eagle	V		X	X	X	Yes
**Hieraaetus morphnoides*	Little Eagle	V		X	X	X	Yes
Hirundapus caudacutus	White-throated Needletail		V	X	X	X	Yes
**Lathamus discolor*	Swift Parrot	E	CE	X	X	X	Yes
**Lophoictinia isura*	Square-tailed Kite	V		X	X	X	Yes
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	V			X	X	Yes
Melithreptus gularis gularis	Black-chinned Honeyeater	V		X	X	X	Yes
Micronomus norfolkensis	Eastern Coastal Freetail-bat	V		X	X	X	Yes
**Miniopterus australis*	Little Bent-wing bat	V		X	X	X	Yes
**Miniopterus orianae oceansis*	Large Bent-wing bat	V		X	X	X	Yes
Neophema pulchella	Turquoise Parrot	V		X	X	X	Yes
**Ninox connivens*	Barking Owl	V		X	X	X	Yes
**Ninox strenua*	Powerful Owl	V		X	X	X	Yes
Nyctophilus corbeni	Corben's Long-eared Bat	V	V			X	Yes
**Pandion cristatus*	Eastern Osprey	V				X	Yes
Petaurus australis	Yellow-bellied Glider	V		X	X	X	Yes

Scientific Name	Common Name	BC Act	EPBC Act	PCT 1589	PCT 1590	PCT 1619	Habitat Present
Petroica boodang	Scarlet Robin	V		X	X	X	Yes
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	V		X	X	X	Yes
**Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	X	X	X	Yes
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		X	X	X	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	V		X	X	X	Yes
Stagonopleura guttata	Diamond Firetail	V		X	X		Yes
**Tyto novaehollandiae*	Masked Owl	V		X	X	X	Yes

Key:
V = Vulnerable E = Endangered CE = Critically Endangered * Dual Credit Species

The vegetation within the subject land has been assessed to provide suitable habitat for all 33 species listed above in at least one PCT within the site. It is therefore assumed that these species may utilise the subject land for foraging opportunities.

Justification for Ecosystem Credit Species assessed as no habitat present within vegetation zone(s) for the PCT(s) are described below in **Table 5.**

Table 5 Ecosystem Credit Species assessed as not within vegetation zone(s) for the PCT(s)

Scientific Name	Common Name	Habitat requirement	Unsuitable Zones	Habitat Constraint
Petaurus australis	Yellow-bellied Glider	The Yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria. Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. No hollow-bearing trees with hollows >25cm diameter are within VZ2 and VZ5 therefore no further assessment is required.	VZ2 and VZ5	Yes

5.3 Species Credit Species

Species Credit Species, or Candidate species, are species that cannot be reliably predicted to use an area based on habitat surrogates. Candidate species that are likely to occur within the subject land must be surveyed to determine presences/absence or provide an expert report. In the absence of either of these the species will be presumed to be present within the subject land.

The conditions of vegetation and habitat within the subject land can be assessed by an accredited assessor to have sufficient site degradation of the key habitat constraints associated with species credits species, therefore is unlikely to utilise the subject land and not requiring further assessment. These species are presented in **Table 6** and a habitat assessment for species credit species in **Table 7**.

Table 6 Species Credit Species

Scientific Name	Common Name	BC Act	EPBC Act	Survey Period	Paddock Trees	Requires further assessment
Acacia bynoeana	Bynoe's Wattle	E	V	Sept-March		Yes
Angophora inopina	Charmhaven Apple	V	V	All year	Yes	No
Anthochaera phrygia	Regent Honeyeater (Breeding)	CE	CE	N/A		No
Asperula asthenes	Trailing Woodruff	V	V	Oct-Dec		Yes
Burhinus grallarius	Bush stone-curlew	E	-	All year	Yes	Yes
Callistemon linearifolius	Netted Bottle Brush	V	-	Oct-Jan		Yes
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	V	-	Oct-Jan		Yes
Calyptorhynchus lathami	Glossy Black Cockatoo (Breeding)	V	-	Jan-Sep	Yes	Yes
Cercartetus nanus	Eastern Pygmy-possum	V	-	Oct-March		Yes
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Sept-March		No
Crinia tinnula	Wallum Froglet	V	-	All year		No
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	Nov-Jan		Yes
Cynanchum elegans	White-flowered Wax Plant	E	E	All year		Yes
Diuris praecox	Rough Doubletail	V	V	July-Aug		No
Dromaius novaehollandiae – endangered population	Emu population in the New South Wales North Coast Bioregion and Port Stephens LGA	E	-	All year		No
Eucalyptus camfieldii	Camfield's Stringbark	V	V	All year		Yes

Scientific Name	Common Name	BC Act	EPBC Act	Survey Period	Paddock Trees	Requires further assessment
Eucalyptus glaucina	Slaty Red Gum	V	V	All year		Yes
Eucalyptus pumila	Pokolbin Mallee	V	V	All year		No
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V	All year		Yes
Haliaeetus leucogaster	White-bellied Sea-eagle (Breeding)	V	-	July Dec	Yes	Yes
Hieraaetus morphnoides	Little Eagle (Breeding)	V	-	August-Oct	Yes	Yes
Hoplocephalus bitorquatus	Pale-headed Snake	V	-	Nov-March	Yes	Yes
Lathamus discolor (Breeding)	Swift Parrot	E	CE	May-August	Yes	No
Leionema lamprophyllum subsp. fractum		CE	CE	Sep - Nov		Yes
Litoria aurea	Green and Golden Bell Frog	E	V	Nov-March		Yes
Litoria brevipalmata	Green-thighed Frog	V	-	Oct-March		No
Lophoictinia isura	Square-tailed Kite (Breeding)	V	-	Sept-Jan		Yes
Melaleuca biconvexa	Biconvex Paperbark	V	V	All year		Yes
Melaleuca groveana	Grove's Paperbark	V	-	All year	Yes	Yes
Miniopterus australis	Little Bent-wing bat (Breeding)	V	-	Dec-Feb		No

Scientific Name	Common Name	BC Act	EPBC Act	Survey Period	Paddock Trees	Requires further assessment
Miniopterus orianae oceanensis	Large Bent-wing bat (Breeding)	V	-	Nov-Feb		No
Myotis macropus	Southern Myotis	V	-	Nov-March	Yes	Yes
Ninox connivens	Barking Owl (Breeding)	V	-	May-Dec	Yes	Yes
Ninox strenua	Powerful Owl (Breeding)	V	-	May- August		Yes
Ozothamnus tessellatus		V	V	Sep-Oct	Yes	No
Pandion cristatus	Eastern Osprey (Breeding)	V	-	April-Nov	Yes	No
Persoonia pauciflora	North Rothbury Persoonia	CE	CE	All year	Yes	No
Petauroides volans	Greater Glider		V	All year	Yes	Yes
Petaurus norfolcensis	Squirrel Glider	V	-	All year	Yes	Yes
Petrogale penicillata	Brush-tailed Rock wallaby	E	V	All year		No
Phascogale tapoatafa	Brush-tailed Phascogale	V	-	All year	Yes	Yes
Phascolarctos cinereus	Koala	V	V	All year	Yes	Yes
Planigale maculata	Common Planigale	V	-	All year		Yes
Prostanthera cineolifera	Singleton Mint bush	V	V	Sep-Oct	Yes	No
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	V	V	Oct-Dec		No
Pterostylis chaetophora		V	-	Sep - Nov		Yes

Scientific Name	Common Name	BC Act	EPBC Act	Survey Period	Paddock Trees	Requires further assessment
Rutidosis heterogama	Heath Wrinklewort	V	V	All Year		Yes
Tetratheca juncea	Black-eyed Susan	V	V	Sept-Oct		Yes
Thesium australe	Austral Toadflax	V	V	Nov - Feb		Yes
Tyto novaehollandiae	Masked Owl (Breeding)	V	-	May-Aug	Yes	Yes
Uperoleia mahonyi	Mahony's Toadlet	E	-	Oct-March		No
Vespadelus troughtoni	Eastern Cave Bat	V	-	Nov-Jan		No

Key:

V = Vulnerable E = Endangered CE = Critically Endangered EX = Extinct

Table 7 Species Credit Species Habitat Assessment

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Flora				
Acacia bynoeana	Bynoe's Wattle	This species occurs in heath or dry sclerophyll forest on sandy soils. Prefers open, sometimes disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include *Corymbia gummifera, Eucalyptus haemastoma, Eucalyptus parramattensis*, *Banksia serrata* and *Angophora bakeri.* The vegetation within the subject land comprises a dry & wet sclerophyll forest formation, of which only one of the listed over-storey species (*C. gummifera*) associated with the threatened species occurs. Although there are no records within the locality as defined by the OEH BioNet 10 km search area. No species were detected during targeted surveys, therefore no further assessment is required for the species.	Likely	No
Angophora inopina	Charmhaven Apple	This species occurs most frequently in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina* woodland/forest; (ii) *Hakea teretifolia–Banksia oblongifolia* wet heath; (iii) *Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina* sedge woodland; (iv) *Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest. The subject land is not within the LGAs of Cessnock or Singleton. Further survey is not required.	Unlikely	No
Asperula asthenes	Trailing Woodruff	The trailing woodruff occurs only in NSW. It is found in scattered locations from Bulahdelah north to near Kempsey, with several records from the Port Stephens/Wallis Lakes area. Occurs in damp sites, often along river banks.	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		Areas within the subject land contain damp depressions possibly suitable for this species to establish. Although there are no records within the OEH BioNet 10 km search area. No species were detected during targeted surveys; therefore no further assessment is required for the species.		
Callistemon linearifolius	Netted Bottle Brush	This species grows in dry sclerophyll forest in sheltered locations on the coast and on adjacent ranges. This species is recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. It has also been recorded in Yengo National Park. The vegetation within the subject land is a dry sclerophyll forest formation, comprising associated canopy species. All PCTs found within the subject land are associated with this species. 380 records exist within the OEH BioNet 10 km search area. No species were detected during targeted surveys; therefore no further assessment is required for the species.	Likely	No
Cryptostylis hunteriana	Leafless Tongue Orchid	This species is known to be extremely cryptic as it does not flower each year. Known to occur within a wide range of habitats including woodlands to swamp heaths. Within the Hunter region larger populations have been typically found in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*), and it prefers areas with an open grassy understorey. The species typically prefers moist sandy soils in sparse to dense heath and sedge land, or moist to dry clay loams in coastal forests. This species is known to occur in association with *C. subulata* and *C. erecta.* The subject land comprises marginal habitat in the form of open grassy understorey, however due to past disturbance the grass layer is very dense in areas with potential habitat, which is not optimal conditions for successful flowering. Additionally, no associated canopy or ground-stratum species occur within the study area. Furthermore, this species has not been recorded within the OEH BioNet 10 km search area. No species were detected during targeted surveys; therefore, no further assessment is required for the species.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		Although the likelihood of occurrence for the species was considered very low based on the lack of marginally habitat. All threatened flora surveys were carried out during the optimal time for survey of this species. Furthermore, it was confirmed that this species was flowering in the wider region at the time of survey (Central Coast Council email and author pers comm.)		
Cynanchum elegans	White-flowered Wax Plant	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation. Other associated vegetation types include littoral rainforest; Coastal Tea-tree *Leptospermum laevigatum* – Coastal Banksia *Banksia integrifolia* subsp. *integrifolia* coastal scrub; Forest Red Gum *Eucalyptus tereticornis* aligned open forest and woodland; Spotted Gum *Corymbia maculata* aligned open forest and woodland; and *Melaleuca armillaris Bracelet* Honey myrtle scrub to open scrub. The subject land comprises marginal habitat in the form of *Corymbia maculata* dominated dry open forest. Additionally, three records exist within the OEH BioNet 10 km search area. No species were detected during targeted surveys; therefore no further assessment is required for the species.	Likely	No
Diuris praecox	Rough Doubletail	The habitat of this species is generally on hills and slopes of near coastal districts in open forests which have a grassy to fairly dense understorey. This species grows on well-drained sandy soils (DoEE 2008). The vegetation within the subject land is a dry sclerophyll forest formation. The species is restricted to sclerophyll forests in coastal or in close-proximity to coastal areas of central eastern NSW (OEH 2021, Yates et al. 2020), Although the site contains sandy soils, the site is approximately 13 km away from the coastal fringe of which this species is recorded. Additionally, no records exist as defined by the OEH Bionet 10 km search area. No further survey is required.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Eucalyptus camfieldii	Camfield's Stringybark	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. The vegetation within the subject land is likely inappropriate as no heath formation is present within the site. Additionally, no OEH Bionet records exist within the 10 km search area. Regardless of the lack of records, the species was surveyed for opportunistically during flora transect surveys. No species were detected, therefore no further assessment is required.	Unlikely	No
Eucalyptus glaucina	Slaty Red Gum	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils. The vegetation within the subject land is a dry sclerophyll forest formation, however is east of the known species distribution. Furthermore, there are no OEH Bionet records within the 10 km search area. Regardless of the lack of records, the species was targeted during flora surveys, no species were detected therefore no further assessment is required for the species.	Likely	No
Eucalyptus pumila	Pokolbin Mallee	Currently known only from a single population west of Pokolbin in the Hunter Valley. Historical records also exist for Wyong and Sandy Hollow, however, has not been recorded recently in these areas. 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*. Very little is known about the biology or ecology of this species.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		The vegetation within the subject land is a dry sclerophyll forest formation however is 34 km from the single known population. Therefore, the species does not require further assessment.		
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	This species is sporadically distributed throughout the Sydney Basin with sizeable populations in the Hunter and in the Cessnock - Kurri Kurri area (particularly Werakata NP). Separate populations are also known from Putty to Wyong and Lake Macquarie on the Central Coast. This species grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Occurs in a range of vegetation types from heath and shrubby woodland to open forest, the Hunter in Kurri Sand Swamp Woodland and is also known to occur in *C. maculata- A. costata* open forest. Found over a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Hunter occurrences are usually 30-70m ASL, while the southern Sydney occurrences are typically at 100-300m ASL. Often occurs in open, slightly disturbed sites such as along tracks. Suitable vegetation occurs within the subject land in the formation of dry sclerophyll forest comprising *Corymbia maculata* open forest. All three PCTs (1589, 1590 and 1619) occurring within the subject land are commensurate with which this species is associated with. 71 records exist within the locality as defined on the OEH BioNet Atlas using a 10 km search radius. No species were detected during targeted surveys, therefore no further assessment is required.	Likely	No
Leionema lamprophyllum subsp. fractum		Known record in Pokolbin State Forest occurs on an exposed northern facing slope. Historical record from Munghorn Gap Nature Reserve is documented as occurring in a slightly sheltered location between sandstone boulders. Common co-occurring species include *Corymbia maculata*, *Eucalyptus sparsifolia*, *Pultenaea spinosa*, *Leptospermum trinervium*, *Acacia parvipinnula*, *Dillwynia sieberi*, *Persoonia linearis*, *Leucopogon muticus*, *Astrotricha* sp. Quorrobolong (S. Lewer 40), *Correa reflexa* var. *reflexa*, *Patersonia sericea*, *Entolasia stricta*, *Cleistochloa*	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		rigida, *Pomax umbellata*, *Lepidosperma gunnii* and *Lomandra confertifolia* subsp. *rubiginosa* (Bell and Walsh 2015). Associated vegetation exists within the subject land, additionally several rocky outcrops are present. No OEH species records exist within the 10 km search area. Rocky outcrops were within the study area. No species were detected during targeted surveys, therefore no further assessment is required.		
Melaleuca biconvexa	Biconvex Paperbark	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. A small area of the subject land comprises a marginally damp place adjacent to an ephemeral creek, which could potentially become a waterbody during period of high rainfall. Eight records exist within the 10 km search area. No species were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Melaleuca groveana	Grove's Paperbark	This species grows in heath and shrubland, often in exposed sites, in low coastal hills, escarpment ranges and tablelands on outcropping granite, rhyolite and sandstone on rocky outcrops and cliffs. It also occurs in dry shrubby open forest and woodlands. Although the subject land is a form of dry shrubby open forest, no OEH Bionet records exist within the 10 km search area. Regardless, the species was surveyed for with no species detected. Therefore, no further assessment is required.	Likely	No
Ozothamnus tesselatus		Restricted to eucalyptus woodlands in a few locations in an east-west zone south of Bunnan and between west Bylong and east Ravensworth.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		Subject land outside restricted range, ~140 km east of the known locations. Given the location of the study area, no further survey is required.		
Persoonia pauciflora	North Rothbury Persoonia	Extremely restricted distribution; all but one of the plants which make up the only known population occur within a 2.5 km radius of the original specimen at North Rothbury in the Cessnock local government area. Within this range, there are three main sub-populations which comprise approximately 90% of the total population. The other 10% of the population occurs as scattered individuals in what is a relatively disturbed landscape. It is found in dry open forest or woodland dominated by Spotted Gum (*Corymbia maculata*), Broad-leaved Ironbark (*Eucalyptus fibrosa*) and/or Narrow-leaved Ironbark (*E. crebra*) and supporting a moderate to sparse shrub layer and grassy groundcover. The majority of the population is known to occur on silty sandstone soils derived from the Farley Formation. The subject land is not within 10 km of North Rothbury and no OEH records exist within the 10 km search area. No further survey is required.	Unlikely	No
Prostanthera cineolifera	Singleton Mint Bush	Restricted to only a few localities near Scone, Cessnock and St Albans. Grows in open woodlands on exposed sandstone ridges. Usually found in association with shallow or skeletal sands. The subject land contains several rocky outcrops within a dry sclerophyll forest formation. The species occurs on exposed sandstone ridges, of which are not present within the subject land. No records exist within the OEH Bionet 10 km search area and the study area is ~30 km from the nearest known population. As such, no further survey is required.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Pterostylis chaetophora		The preferred habitat is seasonally moist, dry sclerophyll forest with a grass and shrub understorey. The 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*. 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. There are also isolated records from the Sydney region. The species occurs in two conservation reserves, Columbey National Park and Wingen Maid Nature Reserve. Suitable vegetation occurs within the subject land in the formation of dry sclerophyll forest within a semi-moist environment. No records exist within the OEH Bionet 10 km search area. No species were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Rutidosis heterogama	Heath Wrinklewort	This species grows in heath on sandy soils and moist areas in open forest and has been recorded along disturbed roadsides. This species has been recorded from near Cessnock to Kurri Kurri with an outlying occurrence at Howes Valley. Suitable habitat occurs within the subject land in the form of heathy vegetation on sandy soils as well as a small area of moist areas in open forest. A total of 20 records exists within the OEH Bionet 10 km search area. No species were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Tetratheca juncea	Black-eyed Susan	Locally this species is usually found in low open forest/woodland with an undisturbed mixed shrubby understorey and grassy groundcover often in association with the Awaba Soil Landscape. It generally prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral. While some studies	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		show the species has a preference for cooler southerly aspects, it has been found on slopes with a variety of aspects. Suitable habitat exists within the subject land in the form of open forest with a native grassy groundcover. The PCT 1619 Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia found within the subject land is very commonly associated with this threatened species. However, the site does not face the preferred south easterly aspect. >3000 records exist as defined by the OEH Bionet 10 km search. The species was targeted for in September 2023 in addition to November 2019 and again in November 2021. The 2023 survey was undertaken during the peak flowering period for the species. No individuals were detected during targeted surveys; therefore no further assessment is required.		
Thesium australe	Austral Toadflax	Austral Toad-flax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Suitable habitat exists within the subject land in the form of an open forest with grassy understory. No records exist within the EOH Bionet 10 km search area. Regardless of the lack of records, the species was surveyed for during targeted surveys. No individuals were detected during surveys; therefore no further assessment is required.	Likely	No
Birds				

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Anthochaera phrygia	Regent Honeyeater (Breeding)	This species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-Oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. For example; the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events. Flowering of associated species such as Thin-leaved Stringybark *Eucalyptus eugenioides* and other Stringybark species, *and Broad-leaved Ironbark E. fibrosa can also contribute important nectar flows at times.* The subject land comprises suitable winter foraging habitat such as *Corymbia maculata, E. fibrosa* and stringybark species, however the subject land is not located within Important Mapped Areas for this species. Six records occur within the OEH Bionet 10 km search area.	Unlikely	No
Burhinus grallarius	Bush stone Curlew	This species inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Nests on the ground in a scrape or small bare patch. 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. Marginal suitable habitat is found within the subject land in the form of open forests and woodlands with fallen timber. The subject land contains high levels of *Lantana camara* infestations, therefore much of the site is unsuitable. Two records occur within the OEH Bionet 10 km search area. On this basis the likelihood for this species to occur within the study area cannot be discounted.	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		No individuals were detected during targeted surveys; therefore no further assessment is required.		
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	This species is usually found in spring and summer in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. This species favours old growth forest and woodland attributes for nesting and roosting. Nests are located in hollows that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts. The subject land comprises marginal suitable foraging habitat in the form of open eucalypt forests and woodlands and hollows suitable for breeding (>10 cm) exist within the site. Furthermore, 11 records exist within the OEH BioNet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Calyptorhynchus lathami	Glossy Black Cockatoo (Breeding)	The species is uncommon although widespread throughout suitable forest and woodland habitats. Inhabits open forest and woodlands of the coast where stands of She-oak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods. Feeds almost exclusively on the seeds of several species of she-oak (*Casuarina* and *Allocasuarina* species). This species is dependent on large hollow-bearing eucalypts for nest sites. Suitable habitat trees (Breeding) occur within the subject land. Trees harbouring hollows >15 cm and >8 m above the ground were recorded within the subject land. A total of 17 records exist within the OEH Bionet 10 km search area. On this basis, this species likelihood to occur cannot be discounted. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Dromaius novaehollandiae – endangered population	Emu population in the New South Wales North Coast Bioregion and Port Stephens LGAs	On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest. he species was formerly widespread in north-eastern NSW, but is now restricted to coastal and near-coastal areas between Evans Head and Red Rock and a small isolated population further west in the Bungawalbin area. The range of the species continues to contract in recent years. It now appears to be absent from Broadwater National Park, there are few recent sightings from its former stronghold in Bundjalung National Park and it is not known whether a natural population continues to persist in the Port Stephens area. The study area is outside the LGA of Port Stephens, there for no further survey is required.	Unlikely	No
Haliaeetus leucogaster	White-bellied Sea-eagle (Breeding)	In New South Wales this species is widespread along the east coast, and along all major inland rivers and waterways. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. The subject land is located within 1 km of moderate waterbodies, therefore limited potential breeding habitat is present within the site. Greater than 600 records exist within the OEH BioNet 10 km search area, including a record over the subject land (2010). No individuals were detected during repeated targeted surveys; therefore no further assessment is required.	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Hieraaetus morphnoides	Little Eagle (Breeding)	Occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Suitable roosting habitat in the formation of large trees within remnant patches exist on site. Additionally, one record ~500 m from the subject land exists within the OEH BioNet 10 km search area. No individuals were detected during repeated targeted surveys; therefore no further assessment is required.	Likely	No
Lathamus discolor	Swift Parrot (Breeding)	This species migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there is abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. The subject land comprises suitable winter foraging habitat such as *Corymbia maculata*, however the study area is not located within draft Important Mapped Areas for this species. Therefore, no surveys targeting the species or further assessment required.	Unlikely	No
Lophoictinia isura	Square-tailed Kite (Breeding)	This species is found in a variety of timbered habitats including dry woodlands and open forests and shows a particular preference for timbered watercourses. This species 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. In NSW, scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems. Breeding sites are	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		generally located along or near watercourses, in a fork or on large horizontal limbs. The subject land comprises suitable habitat in the formation of dry sclerophyll forest, however no major river systems exist nearby. A total of 27 records exist within the OEH BioNet 10 km search area. No individuals were detected during repeated targeted surveys; therefore no further assessment is required.		
Ninox connivens	Barking Owl (Breeding)	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Roost in shaded portions of tree canopies, including tall midstorey trees with dense foliage such as *Acacia* and *Casuarina* species. The subject land comprises of suitable foraging habitat in the formation of dry sclerophyll forest, within an urban landscape. Suitable roosting or nesting habitat exists in the form of dead and living eucalypts with large hollows. Five records exist within the OEH BioNet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Ninox strenua	Powerful Owl (Breeding)	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. This species requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, Rough-barked Apple *Angophora floribunda*, Cherry Ballart *Exocarpus cupressiformis* and a number of eucalypt species. The main prey items are medium-sized arboreal marsupials, particularly the Greater Glider, Common Ringtail Possum and Sugar Glider. As most prey species require hollows and a shrub layer, these are important habitat components for the owl. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old.	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		The subject land comprises of suitable foraging habitat in the formation of dry sclerophyll forest, within an urban landscape. Suitable roosting or nesting habitat exists in the form of dead and living eucalypts with large hollows. Greater than 200 records exist within the OEH BioNet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.		
Pandion cristatus	Eastern Osprey (Breeding)	This species favours coastal areas, especially the mouths of large river, lagoons and lakes. This species breeds in nests that are made high up in dead trees or in the crowns of live trees, usually within one kilometres of the sea. The subject land is located >10 km from the coast and > 8 km from the closest river being the Hunter River. On this basis no suitable foraging or breeding habitat occurs within the study area. No further survey is required.	Unlikely	No
Tyto novaehollandiae	Masked Owl (Breeding)	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting. The typical diet consists of tree-dwelling and ground mammals, especially rats. Extends from the coast where it is most abundant to the western plains. Overall records for this species fall within approximately 90% of NSW. Pairs have a large home-range of 500 to 1000 hectares. The subject land comprises of suitable foraging habitat in the formation of dry sclerophyll forest, within an urban landscape. Suitable roosting or nesting habitat exists in the form of dead and living eucalypts with large hollows. A total of 51 records exist within the OEH BioNet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Bats				

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Chalinolobus dwyeri	Large-eared Pied Bat	Found mainly in areas with extensive cliffs and caves. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. The structure of maternity roosts appears to be very specific (arch caves with dome roofs). Caves need to be high and deep enough to allow juvenile bats to learn to fly safely inside and have indentations in the roof. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. Rocky outcrops exist within the subject land, however they only contain small shallow crevices unsuitable for breeding. Two culverts were observed within close proximity to the subject land, located on Minmi Rd north of the site. The culverts were inspected during breeding season, of which one of the culverts contained crevices that could not be fully inspected. A roost watch was conducting during breeding season, no microbats were observed interacting with the culvert. Therefore, it was deemed that no suitable breeding habitat is present on the subject land or in close proximity to the site. An analysis was undertaken within a 2 km radius of the subject land using high resolution aerial imagery and topographic maps in accordance with the BAM guideline, 'Species credit' threatened bats and their habitat – NSW survey guide for the BAM (OEH 2018) (**Appendix L**). The Wallsend to Minmi was a significant coal mining area in the late nineteenth to mid twentieth century, forested areas were logged for pit props. Review of historic aerial imagery shows no clearing of forested areas into the west or south of the subject land. The Summerhill Waste Depot is located within a 2 km radius of the subject land, this was a former open cut pit however is now an active waste facility. Topography analysis determined that potential habitat may exist in the very north east of the 2 km search area, depicted by contours. Aerial imagery shows vegetation to be relatively homogenous within these areas, therefore it is unclear whether the areas are an escarpment or steep slope. As such, species polygons were conservatively mapped. Species polygons were mapped as per Table 1 & Table 2 of 'Species	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		credit' threatened bats and their habitat – NSW survey guide for the BAM (OEH 2018). Species polygons did not fall within 100 m of the subject land and therefore breeding habitat was excluded from the assessment. As per Table 1 of the methodology, PCTs within the species polygon boundary did not align with PCTs on the subject land which the species is associated with (See **Appendix L**), therefore no species polygons are required. The species was detected as a possible detection from the Anabat deployment. A total of 25 records exist within the OEH BioNet 10 km search area. Owing to the lack of breeding habitat and foraging habitat within the subject land, as per the BAM assessment guidelines, no further survey is required due to the lack of potential habitat.		
Miniopterus australis	Little Bent-wing bat (Breeding)	Inhabits moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bent- wing bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats. Only five nursery sites /maternity colonies are known in Australia. The subject land comprises dry sclerophyll forest with no naturally occurring caves. Rocky outcrops exist within the subject land, however they only contain small shallow crevices unsuitable for breeding. Two culverts were observed within close proximity to the subject land, located on Minmi Rd north of the site. The culverts were inspected during breeding season, of which one of the culverts contained crevices that could not be fully inspected. A roost watch was conducting during breeding season, no microbats were observed interacting with the culvert. An analysis was undertaken within a 100 m radius of the subject land using high resolution aerial imagery and topographic maps in accordance with the BAM guideline, 'Species credit' threatened bats and their habitat – NSW survey guide for the BAM (OEH 2018) (**Appendix L**). No potential habitat was identified. Therefore, it was deemed that no suitable breeding habitat is present on the subject land or in close proximity to the site.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		Potential foraging habitat exists within the subject land, the species was detected from the Anabat deployment. Approximately 400 records exist within the OEH BioNet 10 km search area. Owing to the lack of breeding habitat within the subject land, no further survey is required due to the lack of potential habitat.		
Miniopterus schreibersii oceanensis	Large Bent-wing bat (Breeding)	Large Bent-winged Bats occur along the east and north-west coasts of Australia. Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Form discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia. Breeding or roosting colonies can number from 100 to 150,000 individuals. Hunt in forested areas, catching moths and other flying insects above the tree tops. The subject land comprises dry sclerophyll forest with no naturally occurring caves. Rocky outcrops exist within the subject land, however they only contain small shallow crevices unsuitable for breeding. Two culverts were observed within close proximity to the subject land, located on Minmi Rd north of the site. The culverts were inspected during breeding season, of which one of the culverts contained crevices that could not be fully inspected. A roost watch was conducted during breeding season, no microbats were observed interacting with the culvert. An analysis was undertaken within a 100 m radius of the subject land using high resolution aerial imagery and topographic maps in accordance with the BAM guideline, 'Species credit' threatened bats and their habitat – NSW survey guide for the BAM (OEH 2018) (**Appendix L**). No potential habitat was identified. Therefore, it was deemed that no suitable breeding habitat is present on the subject land or in close proximity to the site. Potential foraging habitat exists within the subject land, the species was not detected from the Anabat deployment. 167 records exist within the OEH BioNet 10 km search area. Owing to the lack of breeding habitat within the subject land, no further survey is required due to the lack of potential habitat.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Myotis macropus	Southern Myotis	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. The subject land comprises suitable foraging habitat in the form of open forests and woodlands, harbouring hollow-bearing trees appropriate for breeding. Additionally, a waterbody >3 m wide exists within the site which provides appropriate foraging habitat for the species. A total of 19 records exist within the OEH BioNet 10 km search area. The species was detected as probable during the Ananbat deployment. Therefore, further assessment is required.	Likely	Yes
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Feed on the nectar and pollen of native trees, in particular *Eucalyptus, Melaleuca* and *Banksia*, and fruits of rainforest trees and vines. No known roosting colonies are present on site. The closest breeding camp exists 8.8 km south-east of the site. The species was observed frequently foraging within the subject land, however no further assessment is required for the species owing to the lack of breeding habitat present.	Unlikely	No
Vespadelus troughtoni	Eastern Cave Bat	A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest. Literature suggests that the species favours deep sandstone overhangs that contain domes and occasionally buildings or fairy tern martin nests (Law & Chidel 2007, Law et al. 2005).	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		The subject land comprises dry sclerophyll forest with no naturally occurring caves. Rocky outcrops exist within the subject land, however they only contain small shallow crevices unsuitable for breeding. Two culverts were observed within close proximity to the subject land, located on Minmi Rd north of the site. The culverts were inspected during breeding season, of which one of the culverts contained crevices that could not be fully inspected. A roost watch was conducted during breeding season, no microbats were observed interacting with the culvert. Therefore, it was deemed that no suitable breeding habitat is present on the subject land or in close proximity to the site. An analysis was undertaken within a 2 km radius of the subject land using high resolution aerial imagery and topographic maps in accordance with the BAM guideline, 'Species credit' threatened bats and their habitat – NSW survey guide for the BAM (OEH 2018) (**Appendix L**). The Wallsend to Minmi was a significant coal mining area in the late nineteenth to mid twentieth century, forested areas were logged for pit props. Review of historic aerial imagery shows no clearing of forested areas into the west or south of the subject land. The Summerhill Waste Depot is located within a 2 km radius of the subject land, this was a former open cut pit however is now an active waste facility. Topography analysis determined that potential habitat may exist in the very north east of the 2 km search area, depicted by contours. Aerial imagery shows vegetation to be relatively homogenous within these areas, therefore it is unclear whether the areas are an escarpment or steep slope. As such, species polygons were conservatively mapped. Species polygons were mapped as per Table 1 & Table 2 of 'Species credit' threatened bats and their habitat – NSW survey guide for the BAM (OEH 2018). Species polygons did not fall within 100 m of the subject land and therefore breeding habitat was excluded from the assessment. As per Table 1 of the methodology, PCTs within the species polygon boundary did not align with PCTs on the subject land which the species is associated with (See **Appendix L**), therefore no species polygons are required. The species was detected as a probable composite detection from the Anabat deployment. A total of 43 records exist within the OEH BioNet 10 km search area. Owing to the lack of breeding habitat and foraging habitat within the		

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		subject land, as per the BAM assessment guidelines, no further survey is required due to the lack of potential habitat.		
Reptiles				
Hoplocephalus bitorquatus	Pale-headed Snake	The Pale-headed Snake is a highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands, cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas. Shelter during the day between loose bark and tree-trunks, or in hollow trunks and limbs of dead trees. The subject land comprises suitable habitat in the form of dry sclerophyll forest and numerous hollow bearing trees. No records exist within the OEH BioNet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Amphibians				
Crinia tinnula	Wallum Froglet	This species inhabits a wide range of habitats, usually associated with acidic swamps on coastal sand plains. They typically occur in sedgelands and wet heathlands. They can also be found along drainage lines within other vegetation communities and disturbed areas, and occasionally in swamp sclerophyll forests. The mapped drainage line within the study area does not contain suitable habitat for this species, the species requires permanent waters or ephemeral pools exhibiting acidic conditions (typically <6 pH). The species is found in sedgelands and wet heathlands, of which is not present within the subject land. Furthermore, no records exist within the OEH Bionet 10 km search area. No	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		species were detected during extensive site coverage over the two year survey period. On this basis no further survey is required.		
Litoria aurea	Green and Golden Bell Frog	Inhabits marshes, dams and stream-sides, particularly those containing bull rushes (*Typha* spp.) or spike rushes (*Eleocharis* spp.). Optimum habitat includes waterbodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia holbrooki*), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The subject land contains suitable habitat in the form of an ephemeral water body with suitable vegetation in the form of bull-rushes and an adjacent grassy area. Furthermore, >1000 records exist within the OEH Bionet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Litoria brevipalmata	Green-thighed Frog	Occurs in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain. It prefers wetter forests in the south of its range but extends into drier forests in northern NSW and southern Queensland. This species is thought to forage in leaf-litter. The vegetation within the subject land is predominantly dry open forest with a small area of vegetation associated with the species, in the form of lowland forest (PCT 1619). Owing to the extreme weather events of 2021-2022, depressions in the landscape did exhibit areas of ephemeral pools, however not within the associated vegetation type for the species. These hydrological characteristics are atypical of the landscape to that extent and are a reflection of the extreme weather event. Furthermore, no records exist within the OEH Bionet 10 km search area limiting the likelihood of this species being present within the subject land. On this basis no further survey is required.	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Uperoleia mahonyi	Mahony's Toadlet	This species is known to inhabit ephemeral and semi-permanent swamps and swales. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Commonly associated with acid paperbark swamps, Mahony's Toadlet also is known to occur in wallum heath, swamp mahogany-paperbark swamp forest, heath shrubland and Sydney red gum woodland. Recent studies suggest intact vegetation adjacent to and within water bodies is an important habitat feature for this species. No suitable habitat occurs within the subject land. The species is a habitat specialist, requiring inhabits highly nutrient impoverished landscapes containing heath or wallum vegetation and a sandy substrate (DPIE 2020). Additionally, no records exist within the OEH Bionet 10 km search area. The species is unlikely to occur within the subject land, therefore no further assessment is required.	Unlikely	No
Marsupials				
Cercartetus nanus	Eastern Pygmy - Possum	This species is found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, but in most areas woodlands and heath appear to be preferred, except in north-eastern NSW where they are most frequently encountered in rainforest. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable. Shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests etc. Tree hollows are favoured. The subject land comprises very marginal suitable vegetation in the form of dry sclerophyll forest. No banksias and limited bottlebrushes were observed within the subject land, which are important foraging habitat features for this species. Although the site does contain tree hollows and Box-Ironbark species. Two records exist within the OEH Bionet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Petauroides volans	Greater Glider	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Roosts in tree hollows and is more common in areas abundant in tree hollows. The vegetation within the subject land is broadly appropriate and tree hollows exists within the site. A total of 10 records exist within the OEH Bionet 10 km search area. No individuals were detected during targeted surveys; therefore no further assessment is required.	Likely	No
Petaurus norfolcensis	Squirrel Glider	Inhabits mature or old growth Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites. A total of 107 records exist within the OEH BioNet Atlas 10 km search area, including a single record ~60 m west of the site (dated from 1999). The site comprises preferential habitat in the form of autumn/winter flowering trees such as *Corymbia maculata* and *C. gummifera*. Numerous large mature trees with hollows occur within the subject land. The species was detected during the 2022 remote camera deployment, therefore further assessment is required.	Likely	Yes
Petrogale penicillata	Brush-tailed Rock wallaby	This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Generally, browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night. The subject land contains several rocky outcrops, however not likely enough to qualify as appropriate habitat for the species. No records exist within the OEH BioNet Atlas 10 km search area. Additionally, the species was not encountered	Unlikely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
		during targeted survey works or incidentally during site visits, given the conspicuous nature of the species, it is unlikely to be present on the subject land.		
Phascolarctos cinereus	Koala	Inhabit eucalypt woodlands and forests in a fragmented distribution throughout eastern Australia. In NSW this species mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range but have been recorded in the southern tablelands. This species feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. 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. The subject land contains suitable habitat with several Koala Use tree species present within the site. A total of 65 records exist within the OEH BioNet Atlas 10 km search area. No individuals or signs of presence was detected during targeted surveys; therefore no further assessment is required.	Likely	No
Phascogale tapoatafa	Brush-tailed Phascogale	This species prefers dry sclerophyll open forest with a 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. The subject land contains marginal suitable habitat in the form of dry sclerophyll open forest, sometimes occurring with sparse groundcover. Numerous hollow-bearing trees occur within the subject land. No records exist within the OEH BioNet Atlas 10 km search area. No individuals or signs of presence was detected during targeted surveys; therefore no further assessment is required.	Likely	No

Scientific Name	Common Name	Habitat requirement	Habitat present on development site	Species requires further assessment
Planigale maculata	Common Planigale	Inhabit rainforest, eucalypt forest, heathland, marshland, grassland and rocky areas where there is surface cover, and usually close to water. They are active at night and during the day shelter in saucer-shaped nests built in crevices, hollow logs, beneath bark or under rocks. Marginal habitat occurs within the subject land in the form of a dry eucalypt open forest. Limited hollow logs occur within areas close to water, limited suitable rocks are present, though grass tussocks are present. The subject land has high infestations of *Lantana camara,* especially in areas close to waterbodies. Furthermore, no records exist as defined by the OEH Bionet 10 km search area. No individuals or signs of presence was detected during targeted surveys; therefore no further assessment is required.	Likely	No

5.4 Candidate Species Surveys

5.4.1 Survey Methodology

Targeted surveys for all flora and fauna candidate species recognised to have potential to occur within the subject land were carried out by an ecologist from MJD Environmental (2019-2023) as part of the works informing this BCAR.

Targeted flora surveys were conducted in accordance with the BAM (2020), and requirements for threatened flora surveys in line with the OEH Threatened Flora guidelines (2020).

Targeted fauna survey were conducted in accordance with the requirements and guidelines as specified by the Threatened Biodiversity Data Collection (TBDC) managed by Department of Planning and Environment (DPE) to determine minimum fauna survey effort required for candidate species as per Section 5 of the BAM.

Flora Survey

Targeted threatened flora surveys were carried out on the 13th, 15th & 20th November 2019, 23rd & 24th November 2021, 22nd, 25th & 26th of September 2023. Surveys were targeting flora species that could not be conclusively ruled out from potentially occurring within the subject land due to the presence of suitable habitat. They are:

- *Acacia bynoeana* Bynoe's Wattle
- *Asperula asthenes* Trailing Woodruff
- *Callistemon linearifolius* Netted Bottle Brush
- *Cryptostylis hunteriana* Leafless Tongue Orchid
- *Cynanchum elegans* White-flowered Wax Plant
- *Eucalyptus camfieldii* Camfield's Stringybark
- *Eucalyptus glaucina* Slaty Red Gum
- *Grevillea parviflora* subsp. *parviflora* Small-flower Grevillea
- *Leionema lamprophyllum subsp. fractum*
- *Melaleuca biconvexa* Biconvex Paperbark
- *Melaleuca groveana* Grove's Paperbark
- *Pterostylis chaetophora*
- *Rutidosis heterogama* Heath Wrinklewort
- *Tetratheca juncea* Black-eyed Susan
- *Thesium australe* Austral Toadlfax

Targeted threatened flora surveys were undertaken in accordance with the *NSW Surveying threatened plants and their habitat* (DPIE 2020). The following techniques were employed:

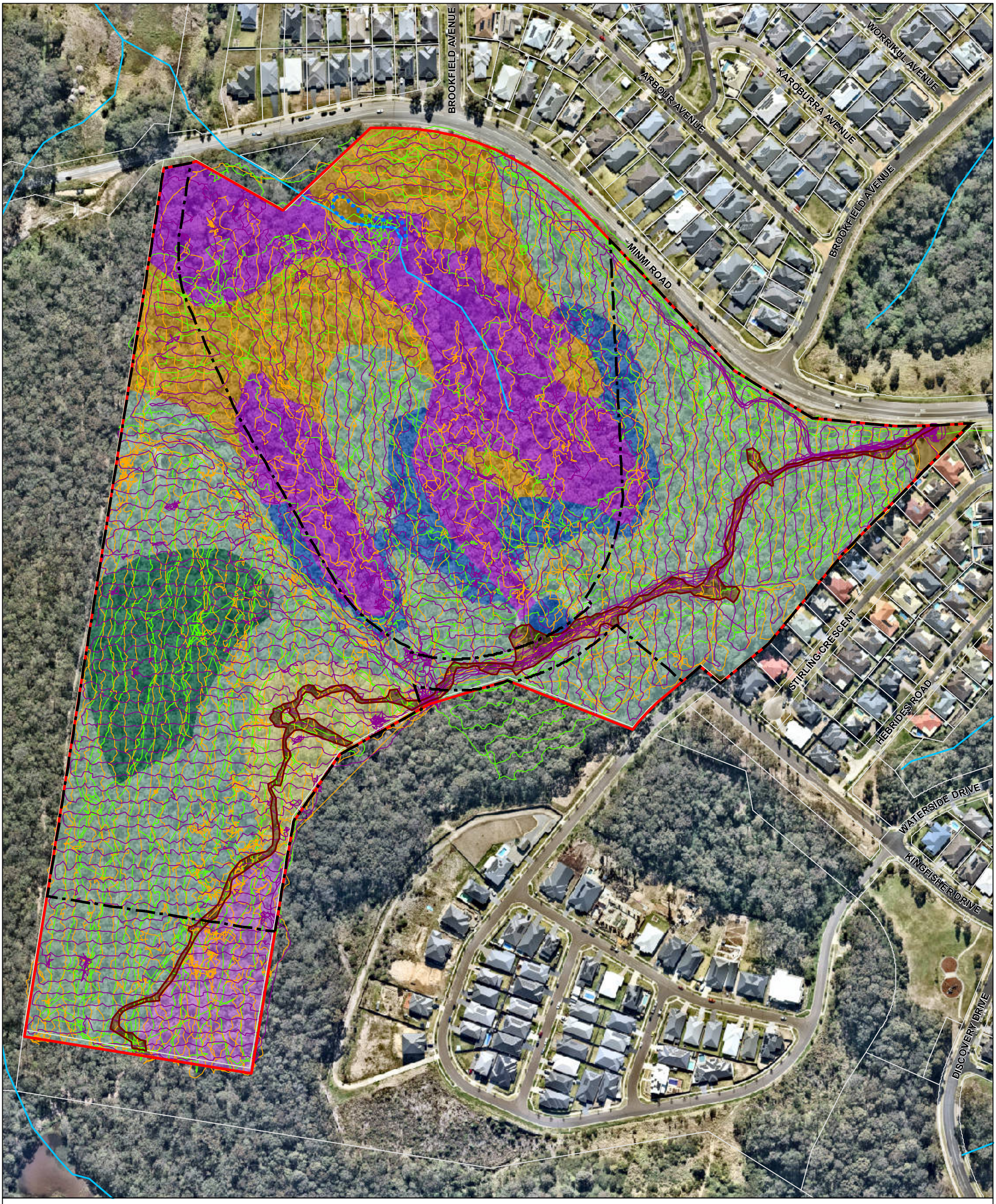
- Parallel field-transverse survey technique. Up to four ecologists walking at a distance of between 5 m to 10 m depending on density of the vegetation was at time of survey
- Surveys conducted in suitable habitat for each of the targeted species
- Transects were recorded using a hand-held GPS unit.

The following **Table 8** provides the survey schedule for each species. Refer to **Figure 4** for survey transects.

Table 8 Flora survey timeframes

Species	Survey Period	Survey Carried out	Presence/ Absence	Comment
Acacia bynoeana	All year	13th, 15th and 20th November 2019	Not recorded	
Asperula asthenes	Oct-Dec	23rd, 24th November 2021	Not recorded	Small areas of the subject land were inaccessible due to the high prevalence of *Lantana camara.* However, the high presence of *L. camara* supresses ground and mid stratum cover, containing in appropriate habitat for the species.
Callistemon linearifolius	Oct-Jan	13th, 15th and 20th November 2019	Not recorded	
Cryptostylis hunteriana	Nov-Jan	13th, 15th and 20th November 2019	Not recorded	
Cynanchum elegans	All year	13th, 15th and 20th November 2019	Not recorded	
Eucalyptus camfieldii	All year	23rd, 24th November 2021	Not recorded	Small areas of the subject land were inaccessible due to the high prevalence of *Lantana camara.* However, the high presence of *L. camara* supresses ground and mid stratum cover, containing in appropriate habitat for the species.
Eucalyptus glaucina	All year	23rd, 24th November 2021	Not recorded	Small areas of the subject land were inaccessible due to the high prevalence of *Lantana camara.* However, the high presence of *L. camara* supresses ground and mid stratum cover, containing in appropriate habitat for the species.
Grevillea parviflora subsp. parviflora	All year	13th, 15th and 20th November 2019	Not recorded	
Leionema lamprophyllum subsp. fractum	Sep-Nov	23rd, 24th November 2021	Not recorded	Small areas of the subject land were inaccessible due to the high prevalence of *Lantana camara.* However, the high presence of *L. camara* supresses ground and mid stratum cover, containing in appropriate habitat for the species.
Melaleuca biconvexa	All year	13th, 15th and 20th November 2019	Not recorded	

Melaleuca groveana	All year	13th, 15th and 20th November 2019	Not recorded	
Pterostylis chaetophora	Sep-Nov	23rd, 24th November 2021	Not recorded	Small areas of the subject land were inaccessible due to the high prevalence of *Lantana camara.* However, the high presence of *L. camara* supresses ground and mid stratum cover, containing in appropriate habitat for the species.
Rutidosis heterogama	All year	13th, 15th and 20th November 2019	Not recorded	
Tetratheca juncea	Sept-Oct	13th, 15th and 20th November 2019 & September 2023	Not recorded	Small areas of the subject land were inaccessible due to the high prevalence of *Lantana camara.* However, the high presence of *L. camara* supresses ground and mid stratum cover, containing in appropriate habitat for the species.
Thesium australe	Nov-Feb	23rd, 24th November 2021	Not recorded	Small areas of the subject land were inaccessible due to the high prevalence of *Lantana camara.* However, the high presence of *L. camara* supresses ground and mid stratum cover, containing in appropriate habitat for the species.



505 MINMI RD, FLETCHER

FIGURE 4: TARGETED FLORA SURVEYS

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- 1500m Buffer from Site
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- Targeted Threatened Flora Survey (Sep 2023)
- Targeted Threatened Flora Survey (Nov 2021)
- Targeted Threatened Flora Survey (Nov 2019)

Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 5/10/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

Fauna Survey Methods

Threatened fauna surveys were carried out for species that could not be conclusively ruled out from occurring within the subject land due to suitable habitat.

All fauna surveys have been carried out in accordance with the requirements and guidelines in the TBDC as managed by DPE.

In addition, targeted amphibian surveys were undertaken in accordance with *NSW Survey Guide for Threatened Frogs. A guide for the survey of threatened frogs and their habitat for the Biodiversity Assessment Method (2020)* (DPIE 2020) and targeted reptile surveys were undertaken as per the *Threatened Reptiles – Biodiversity Assessment Method survey guide* (DPE 2022).

Microchiropteran bat surveys were undertaken in accordance with *'Species credit' threatened bats and their habitats – NSW survey guide for the Biodiversity Assessment Method* (OEH 2018).

The survey methodology used for this project was modified to incorporate modern survey techniques and equipment.

Refer to **Table 9** and **Figure 5** to **Figure 8** for all targeted fauna surveys.

Mammals

- *Cercartetus nanus* Eastern Pygmy Possum
- *Petauroides volans* Greater Glider
- *Petaurus norfolcensis* Squirrel Glider
- *Phascogale tapoatafa* Brush-tailed Phascogale
- *Planigale maculata* Common Planigale
- *Phascolarctos cinereus* Koala

Birds

- *Burhinus grallarius* Bush Stone-curlew
- *Callocephalon fimbriatum* Gang-gang Cockatoo
- *Calyptorhynchus lathami* Glossy Black-Cockatoo
- *Haliaeetus leucogaster* White-bellied Sea-Eagle
- *Hieraaetus morphnoides* Little Eagle
- *Lophoictinia isura* Square-tailed Kite
- *Ninox connivens* Barking Owl
- *Ninox strenua* Powerful Owl
- *Tyto novaehollandiae* Masked Owl

Herpetofauna

- *Hoplocephalus bitorquatus* Pale-headed Snake
- *Litoria aurea* Green and Golden Bell Frog

Bats

- *Myotis macropus* Southern Myotis
- *Chalinolobus dwyeri* Large-eared Pied Bat
- *Miniopterus australis* Little Bent-winged Bat
- *Miniopterus orianae oceanensis* Large Bent-winged Bat

- *Vespadelus troughtoni* Eastern Cave Bat
- *Pteropus poliocephalus* Grey-headed Flying-fox

Table 9 Survey Effort

Fauna Group	Target species	Survey Period	Survey Carried out	Survey method	Survey effort	Comment
Herpetofauna	*Hoplocephalus bitorquatus* (Pale-headed Snake)	Nov-March	20th & 25th November 2019, 19th January and 2nd February 2022. 6th February 2023 – 10th February 2023 and 13th, 20th and 28th March 2023	▪ **Herpetofauna surveys** targeting areas of appropriate habitat - Targeted habitat searches/habitat surveys - Opportunistic surveys - Repeated nocturnal spotlighting surveys - Funnel Trapping set across subject land within suitable habitat zones.	- Nocturnal searches - Repeated parallel spotlighting transects – Four survey replicates of 120 person minute surveys across the subject land targeting areas of suitable habitat such as riparian zones within HBTs and trees with shedding bark/complexity of habitat structure. - A total of three arrays with six funnel traps per array for a total of 18 funnels over the subject land. Traps checked at dawn and reset at dusk daily for a total of 72 trap nights.	The species was not detected despite targeted searches as per relevant guidelines.
	Litoria aurea (Green & Golden Bell Frog)	Nov-March	20th & 25th November 2019, 19th January and 2nd February 2022.	▪ **Amphibian surveys** - 200 m transect along the creekline - Nocturnal Call playback & listening - Opportunistic surveys	- The call of each species was broadcast for at least five minutes, followed by five minutes of listening, the area was then spotlighted on foot. - Opportunistically and during field work - A total of 4 call-playback nights were undertaken - A total of 4 transects were undertaken at a distance of >200m each covering the waterbody and associated creekline.	
Arboreal & Terrestrial Mammals	*Cercartetus nanus* (Eastern Pygmy-possum)	Oct-Mar	13th – 27th November 2019, 5th April – 3rd May, 11th	▪ **Infrared Camera Survey** - Cameras were mounted in appropriate habitat within subject land, designed to take	- 14 infrared motion cameras (7 x Terrestrial & 7 x Arboreal) were utilised during field surveys within November 2019. - 36 infrared motion cameras (all arboreal) were utilised during field surveys within April and May 2022,	

Fauna Group	Target species	Survey Period	Survey Carried out	Survey method	Survey effort	Comment
	Petaurus norfolcensis (Squirrel Glider)	All year	and 12th of July 2022.	photographs when triggered by motion - Cameras were used to detect both diurnal and nocturnal faunal movement ▪ **Spotlighting Transects** **-** Spotlighting was conducted using headtorches, as fauna is able to be detected by searching for eyeshine. Headtorches were at least 1000 lm.	as per the TBDC survey methodology for the Brush-tailed Phascogale. - Spotlighting transects were conducted coinciding with Koala, Owl and Frog surveys.	- The species was detected on arboreal cameras over the survey period.
	Petauroides volans (Greater Glider)					
	Phascogale tapoatafa (Brush-tailed Phascogale)	Dec-Jun				
	Planigale maculata	All year	25th- 28th May 2022	▪ **Pitfall Trapping** - Pitfall trap array should comprise 10 m of drift-fence with a 20 L or larger bucket with a lid at either end.	- 16 Arrays of pitfall traps were deployed across the site for 4 consecutive nights as per the adapted methodology approved by BCD threatened species officer.	
	Phascolarctos cinereus (Koala)	All year	20th & 25th November 2019, 11th, 12th and 18th July 2022.	▪ **Spotlighting transects** **-** Spotlighting was conducted using headtorches, as fauna is able to be detected by searching for eyeshine. Headtorches were at least 1000 lm. ▪ **SAT Searches** - SAT requires the identification of a single tree, followed by searching the closet 29 trees and searching in a 1 m circumference at their base for	- 6 x transects were undertaken at a distance of 2500 m in total covering over a large portion of the subject land. - A total of 8.3 person hours were undertaken over 2 contiguous nights. - 11 SAT searches over a single day (18th of July). As per the BAM survey guide for Koala (DPIE 2022), there is to be 0 mm of precipitation 72hrs prior to surveying. It is noted that 13.2 mm of precipitation was	

Fauna Group	Target species	Survey Period	Survey Carried out	Survey method	Survey effort	Comment
				scat. SATs are employed in a maximum grid spacing of 150 m within wooded areas. Search for *P. cinereus* faecal pellets beneath each of the 30 marked trees based on a cursory inspection of the undisturbed ground surface within a distance of 100 centimetres around the base of each tree, followed (if no faecal pellets are initially detected) by a more thorough inspection involving disturbance of the leaf litter and ground cover within the prescribed search area.	recorded on the 15th of July, however this was throughout the earlier hours of the morning. Therefore, there was 72hrs between precipitation and the survey.	
Microchiropteran bats	*Chalinolobus dwyeri* (Large-eared Pied Bat)	Nov-Jan	20th & 25th November 2019, 3rd December 2021, 14th February 2022	• **Habitat Searches** for rocky outcrops/caves, crevices, culverts and structures within and in close proximity of the subject land. All crevices were inspected for evidence of microbat use (urine stains, droppings [scat spray], remains) or the presence of roosting individuals. • **Roost watch** conducted at culverts within close proximity to the subject land boundary. This consisted of watching the culvert 30 mins before sunset and 1hr after sunset for signs of bat use.	- Several rocky crevices were inspected within the subject land, of which were deemed unsuitable breeding habitat (**Section 5.3**). - Two culverts just outside of the north-western boundary of the site were inspected for signs of microbat occupancy, of which were not observed. Roost watches were conducted within February 2022 at one of the culverts, which harboured small crevices that could not be comprehensively inspected.	
	Miniopterus australis (Little Bent-winged bat)	Dec-Feb				
	Miniopterus orianae oceanensis (Large Bent-winged bat)	Dec-Feb				
	Vespadelus troughtoni	Nov-Jan				

Fauna Group	Target species	Survey Period	Survey Carried out	Survey method	Survey effort	Comment
	(Eastern Cave Bat)					
	Myotis macropus (Southern Myotis)	Oct-Mar	13th – 26th November 2019	• **Acoustic detection** Two acoustic records (Anabat passive detector) were deployed. An Anabat unit was deployed near the only waterbody within the site, and an additional unit was deployed within open forest for comprehensive site coverage.	- Anabat units were deployed for a total of 25 trap nights.	- The species was detected as probable at both Anabat unit locations.
Nocturnal Avifauna	*Ninox connivens* (Barking Owl)	May-Dec	20th & 22nd April, 25th & 26th May, 1st & 2nd June 2022	▪ **Potential Nest Tree and Breeding Signs Survey** - Trees containing hollows >20 cm were examined for suitability and signs of breeding. ▪ **Stag Watches** - Trees identified as containing suitable hollows were watched 30 mins prior to sundown and 1 hr following sundown. ▪ **Call back** for aural recognition of threatened owls - Pre-recorded calls of owls with the potential to occur within the study area were broadcast to elicit vocal responses or to attract nocturnal fauna to the playback site. - Calls were broadcast through an amplification system (loud hailer) designed to project the sound for at least 1 km under still night conditions - Spotlighting Transects	- A single tree was deemed containing a suitable hollow for the purpose of breeding. Two consecutive nights of stag watches and call playbacks were undertaken at the tree. - Additionally, several trees considered as likely unsuitable hollows were precautionarily stag watched. - Meandering spotlighting was undertaken across the site following call playbacks.	Primary habitat searches were undertaken at the end of April 2022, which were followed by secondary searches at trees with hollow >20 cm in diameter.
	Ninox strenua (Powerful Owl)	May-August				
	Tyto novaehollandiae (Masked Owl)	May-August				

Fauna Group	Target species	Survey Period	Survey Carried out	Survey method	Survey effort	Comment
	Burhinus grallarius (Bush-stone Curlew)	All year	13th, 15th, 20th, 25th, 27th and 28th November 2019, 25th – 26th May, 1st – 2nd June, 11th and 12th July 2022	▪ **Flushing** - On foot diurnal and nocturnal surveys achieves flushing the cryptic species from terrestrial habitat features. ▪ **Spotlighting transects** - Spotlighting was conducted using headtorches, as fauna is able to be detected by searching for eyeshine. Headtorches were at least 1000 lm ▪ **Call Playback survey** - Calls were projected across the site, predominantly within the wooded areas.	- Flushing throughout all biodiversity surveys - Opportunistically listening for calls during nocturnal works. - Call playbacks within wooded areas. - Searching opportunistically during diurnal field work for nests on the ground (scrape or small bare patch).	
Diurnal Avifauna	*Callocephalon fimbriatum* (Gang-gang Cockatoo)	Oct-Jan	13th, 15th, 20th, 27th and 28th November, 6th December 2019, 20th & 22nd April 2022. A single stick nest search completed 25th October 2023.	▪ **Avifauna surveys** targeting areas if appropriate habitat - **Targeted habitat searches**/signs of breeding/habitat surveys - **Opportunistic surveys**	- Binoculars were used to assess hollow bearing trees with hollows >10cm, 9m above the ground. - Opportunistically - visually or by vocalisation during the early morning and dusk survey efforts.	
	Calyptorhynchus lathami (Glossy Black-Cockatoo)	Jan-Sep				
	Haliaeetus leucogaster (White-bellied Sea-eagle)	Jul-Dec			- Binoculars were used to assess large living and dead trees for large stick nests in a fork or on large horizontal limbs - Opportunistically - visually or by vocalisation during diurnal survey efforts.	- The species was observed flying-over the site, however no signs of breeding were observed within the subject land.

Fauna Group	Target species	Survey Period	Survey Carried out	Survey method	Survey effort	Comment
	Hieraaetus morphnoides (Little Eagle)	Aug-October			- Binoculars were used to assess large living and dead trees for large stick nests in the top half of the tree canopy. - Opportunistically - visually or by vocalisation during the early morning and dusk survey efforts.	- Surveys were conducted mid-November and December 2019. Large stick nests are considered to still be identifiable during this period since it is post breeding season. - Large stick nest surveys were repeated October 2023 during the survey period for all raptor species.
	Lophoictinia isura (Square-tailed Kite)	Oct-Jan			- Binoculars were used to assess large living and dead trees for large stick nests in a fork or on large horizontal limbs - Opportunistically - visually or by vocalisation during diurnal survey efforts.	

Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators included:

- Distinctive scats left by mammals,
- Scratch marks made by various types of arboreal animals,
- Nests made by various guilds of birds,
- Feeding scars on Eucalyptus trees made by Gliders,
- Whitewash, regurgitation pellets and prey remains from Owls,
- Aural recognition of bird and frog calls,
- Skeletal material of vertebrate fauna, and
- Searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, and diggings).

5.4.2 Limitations

Limitations associated with this assessment report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

In these instances, a precautionary approach has been adopted, whereby 'assumed presence' of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

Seasonality & Conditions

The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened species fail. As a consequence, threatened species may be absent from some areas where potential habitat exists for extended periods and this might be the case for nomadic and opportunistic species.

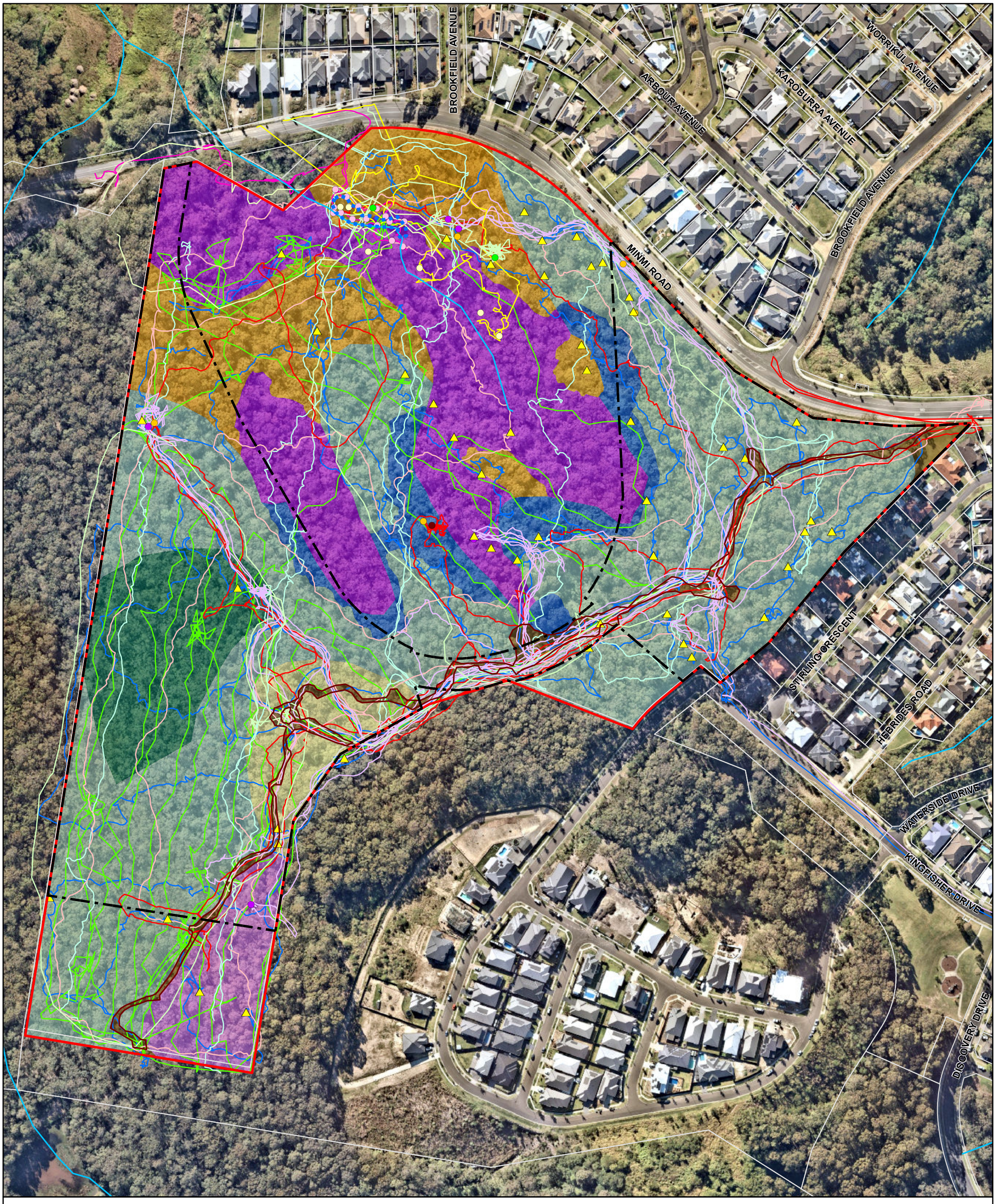
Additionally, Eastern Australia experienced substantially wetter conditions during the summer of 2021 – 2022 due to the declared La Nina. The climate event likely had influence on species occurrence, behaviours and vegetation community traits.

Data Availability & Accuracy

The collated threatened flora and fauna species records provided by NSW BioNet are known to vary in accuracy and reliability. This is usually due to the reliability of information provided to the National Parks and Wildlife Service (NPWS) for collation and/or the need to protect specific threatened species locations. During the review of threatened species records sourced from BioNet Atlas of NSW, consideration has been given to the date and accuracy of each threatened species record in addition to an assessment of habitat suitability within the subject land.

Similarly, EPBC Protected Matters Searches provide a list of threatened species and communities that have been recorded within 10 km of the Study Area, or which have suitable habitat within the wider area, and are subject to the same inherent inaccuracy issues as the State derived databases.

In order to address these limitations in respect to data accuracy, threatened species records have only been used to provide a guide to the types of species that occur within the locality of the Study Area. Consequently, BAM assessment and the results of surveys conducted within the subject land and surrounds have been used to assess the likelihood of occurrence of threatened species, populations and ecological communities to occur therein.



505 MINMI RD, FLETCHER

FIGURE 5: FAUNA SURVEYS - AVES

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- Hollow Bearing Tree
- Call Playback (November 2019)
- Call Playback (January 2022)
- Call Playback (February 2022)
- Call Playback (May 2022)
- Call Playback (June 2022)
- Stag Watch
- Spotlighting Transect (January 2022)
- Spotlighting Transect (February 2022)
- Spotlighting Transect (May 2022)
- Spotlighting Transect (June 2022)
- Spotlighting Transect (July 2022)
- Habitat Search (November 2019)
- Habitat Search (April 2022)
- Habitat Search (October 2023)

Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2022), Moir LA (2021), NSW Spatial Services (2019) | Datum/ Projection: GDA 1994 MGA Zone 56 | Date: 26/10/2023| Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

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FIGURE 6: FAUNA SURVEYS - HERPTOFAUNA

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- Call Playback (Nov. 2019)
- Call Playback (Jan. 2022)
- Call Playback (Feb. 2022)
- Funnel Trap Array (Feb. 2023)
- Spotlighting Transect (Nov. 2019)
- Spotlighting Transect (Jan. 2022)
- Spotlighting Transect (Feb. 2022)

Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

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FIGURE 7: FAUNA SURVEYS - MAMMALS (TRAP EFFORT)

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- Pitfall Locations
- Anabat (Nov. 2019)
- Arboreal Camera (Nov. 2019)
- Terrestrial Camera (Nov. 2019)
- Arboreal Camera Loacation (April 2022)

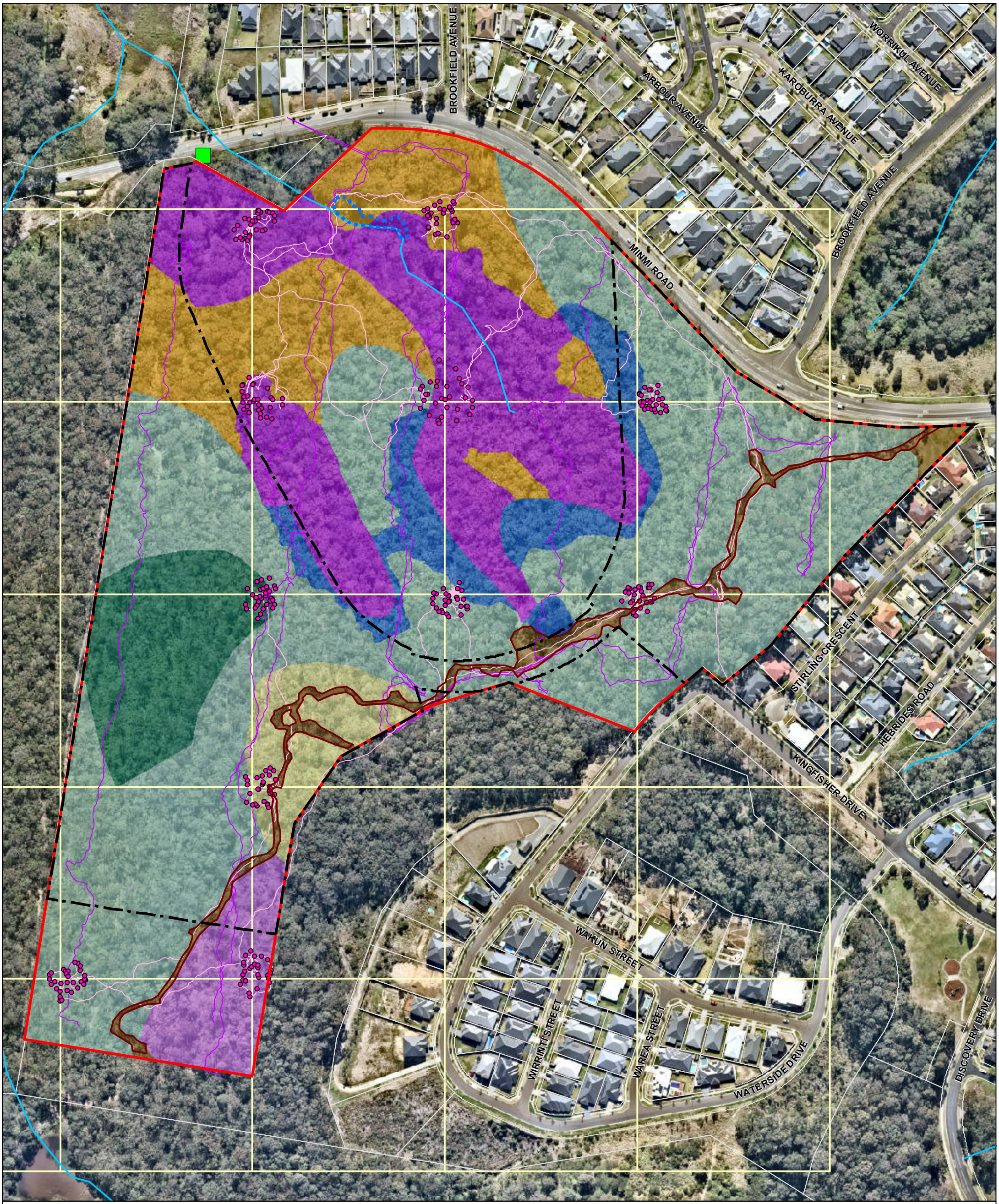
Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.



505 MINMI RD, FLETCHER

FIGURE 8: FAUNA SURVEYS - MAMMALS (SEARCHES)

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- Roost Watch
- SATs
- 150m Grid
- Spotlighting Transect
- SAT Tracks

Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

5.5 Fauna Survey Results

5.5.1 Weather Conditions

Field surveys were undertaken by MJD Environmental between the 13th November 2019 and the 28th March 2023. The prevailing weather conditions during the survey are presented in a **Table 10** below.

Table 10 Prevailing Weather Conditions

Date	Min Temp (ºC)	Max Temp (ºC)	Rain (mm)	Wind (km/h)	Sunrise-Sunset	Relative Humidity (%)
13 November 2019	15.8	21.6	0.0	WSW 17 to SE 26	0545-1930	Not available
14 November 2019	13.2	22.9	0.0	WSW 13 to E 9	0545-1931	Not available
15 November 2019	15.2	32.3	0.0	NW 31 to NW 33	0544-1932	Not available
16 November 2019	18.5	22.7	0.0	SSE 24 to SE 26	0544-1933	Not available
17 November 2019	17.2	21.5	0.0	W 11 to SSE 31	0543-1934	Not available
18 November 2019	18.0	26.2	0.0	NE 7 to E 30	0542-1935	Not available
19 November 2019	16.9	32.4	0.0	WNW 20 to E 24	0542-1935	Not available
20 November 2019	18.9	22.2	0.0	S 31 to SSE 28	0541-1936	Not available
21 November 2019	19.0	29.4	0.0	SE 6 to E 30	0541-1937	Not available
22 November 2019	21.0	33.3	0.0	NW 22 to S 31	0541-1938	Not available
23 November 2019	19.4	22.3	0.6	S 19 to SSE 17	0540-1939	Not available
24 November 2019	18.2	23.3	0.8	S 30 to S 22	0540-1940	Not available
25 November 2019	18.9	26.9	0.0	NNE 6 to E 33	0539-1941	Not available
26 November 2019	17.0	34.7	21.0	N 17 to NW 31	0539-1942	Not available
27 November 2019	15.9	20.6	0.0	SSW 17 to SE 20	0539-1943	Not available
28 November 2019	17.1	22.6	0.0	NNE 6 to E 35	0539 -1944	Not available
23 November 2021	16.8	21.8	7.6	SE 17 to S 17	0540-1940	96
24 November 2021	18.1	25.1	1.4	NE 13 to ENE 37	0539-1942	86
30 November 2021	17.6	20.9	0.0	E 11 to ENE 24	0538-1946	92
3 December 2021	17.6	26.9	0.0	NW 19 to ESE 19	0538-1948	88
19 January 2022	20.3	22.4	7.8	S 43 to S 31	0604-2004	92
2 February 2022	21.8	22.6	4.6	SSW 19 to S 30	0618-1957	97

Date	Min Temp (°C)	Max Temp (°C)	Rain (mm)	Wind (km/h)	Sunrise-Sunset	Relative Humidity (%)
14 February 2022	18.9	25.8	0.0	NNE 7 to ENE 37	0629-1946	65
9 March 2022	19.0	23.3	22.8	WSW 17 to SSW 30	0648-1919	80
5 April 2022	15.5	25.6	0.0	NW 13 to SE 20	0607-1744	68
12 April 2022	Not available	22.6	2.6	SSW 30 to SSE 30	0612-1735	83
19 April 2022	16.9	25.8	0.0	NW 17 to ENE 22	0617-1727	79
20 April 2022	16.0	24.3	0.2	WNW 37 to NW 22	0619-1727	56
22 April 2022	17.2	21.6	12.2	SE 39 to ESE 30	0620-1724	66
26 April 2022	16.2	20.7	1.6	SSW 11 to SSW 15	0622-1719	86
3 May 2022	13.8	23.2	0.0	NW 9 to ESE 17	0627-1712	76
25 May 2022	11.0	19.9	12.4	NW 9 to S 9	0643-1657	97
26 May 2022	12.0	20.9	0.0	W 11 to E 9	0643-1657	90
27 May 2022	11.4	21.5	0.2	WNW 19 to N 4	0645-1657	68
28 May 2022	12.7	21.0	0.0	WNW 19 to WNW 17	0645-1656	70
30 May 2022	9.7	18.1	0.0	NW 22 to NNE 28	0646-1655	71
31 May 2022	8.6	17.3	3.6	WNW 52 to WNW 43	0646-1655	62
1 June 2022	9.6	15.8	0.0	WNW 50 to W 43	0647-1655	38
2 June 2022	8.0	15.1	0.0	WNW 20 to NW 15	0648-1654	70
3 June 2022	7.2	14.0	0.0	NW 19 to NW 20	0648-1654	71
11 July 2022	8.7	16.4	37.4	WSW 11 to SSW 13	0652-1653	83
12 July 2022	7.6	17.1	0.6	WNW 15 to SE 15	0652-1653	97
16 July 2022	6.1	17.1	0.0	NW 20 to NW 24	0654-1705	76
17 July 2022	8.5	20.6	0.0	NW 20 to NW 41	0653-1707	61
18 July 2022	10.8	19.0	0.0	NW 15 to SW 13	0655-1654	60
6 February 2023	15.8	32.4	0.0	ESE 39 to ENE 15	0521-1854	55
7 February 2023	18.6	32.3	0.0	ESE 43 to ENE 15	0522-1853	49
8 February 2023	19.3	30.6	0.0	E 24 to ENE 22	0523-1852	48
9 February 2023	19.4	26.4	0.0	ESE 24 to NE 9	0524-1851	78
10 February 2023	15.2	33.5	0.0	SE 41 to W 11	0525-1850	34
13 March 2023	20.9	34.2	0.5	SE 37 to SSE 11	0551-1815	76
20 March 2023	18.4	27.7	0.0	SSE 41 to W 9	0556-1806	78
28 March 2023	17.3	28.5	17.0	SSW 43 to NE 6	0602-1755	60
22 September 2023	18.8	19.4	0.0	SSE 20 km/hr	0544-1750	42
25 September 2023	20.1	26.8	0.0	NW 9-17 km.hr	0540-1751	60
26 September 2023	4	27.9	0.0	WNW 13 km/hr to NNW 13 km/hr	0539-1752	70
25 October 2023	10.3	35.5	0.0	E 24	0602-1913	71

Sources: http://www.bom.gov.au/climate/data/; http://www.ga.gov.au/bin/geodesy/run/sunrisenset

Mammals

Threatened species Squirrel Glider (*Petaurus norfolcensis*) was recorded within the subject land during the 2022 arboreal remote camera deployment. Additionally, native species including the Brushtail Possum (*Trichosurus vulpecula*), Sugar Glider (*Petaurus breviceps*), Feathertail Glider (*Acrobates pygmaeus*), Brown Antechinus (*Antechinus stuartii*), Bush Rat (*Rattus fuscipes*), Red-necked Wallaby (*Macropus rufogriseus*), Short-beaked Echidna (*Tachyglossus aculeatus*), and the introduced Red Fox (*Vulpes vulpes*) and Black Rat (*Rattus rattus*) were recorded.

Threatened species Grey-headed Flying Fox (*Pteropus poliocephalus*) was observed flying over and sporadically foraging on the site.

Microchiropteran Bats

A total of nine microbat species identified as definite were detected using two Anabat express echo-location call recorder.

Two species identified as definite are listed as *Vulnerable* under the BC Act, specifically the Little Bent-wing Bat (*Miniopterus australis*) and the Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis)*.

Other species identified as definite include:

- White-striped Free-tailed Bat *Austronomus australis*
- Ride's Free-tailed Bat *Mormopterus ridei*
- Gould's Wattled Bat *Chalinolobus gouldii*
- Eastern Broad-nosed Bat *Scotorepens orion*
- Chocolate Wattled Bat *Chalinolobus morio*
- Eastern Forest Bat *Vespadelus pumilus*
- Eastern Horseshoe Bat *Rhinolophus megaphyllus*

Nine bat species identified as probable include:

- Southern Free-tailed Bat *Mormopterus planiceps* – Species composite
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (listed as *Vulnerable* under the BC Act)
- Greater Broad-nosed Bat *Scoteanax rueppellii* – Species composite (listed as *Vulnerable* under the BC Act
- Eastern False Pipistrelle *Falsistrellus tasmaniensis* – Species composite (listed as *Vulnerable* under the BC Act),
- Southern Myotis *Myotis macropus* – Species composite *(*listed as Vulnerable under the BC Act*)*
- Southern Forest Bat *Vespadelus regulus* – Species composite
- Large Bent-winged Bat *Miniopterus orianae oceanensis* - Species composite (listed as Vulnerable under the BC Act)
- Little Forest Bat *Vespadelus vulturnus* – Species composite
- Eastern Cave Bat *Vespadelus troughtoni* – Species composite (listed as Vulnerable under the BC Act)

Two bat species identified as possible include:

- Large-eared Pied Bat *Chalinolobus dwyeri* (listed as *Vulnerable* under the BC and EPBC Acts)
- Large Forest Bat *Vespadelus darlingtoni* – Species composite

Refer to **Appendix C** for a detailed list of recorded species and **Appendix I** for the Anabat Call Recording reports.

Avifauna

Numerous bird species were recorded during the early morning and dusk survey efforts. A total of 26 bird species were identified visually or by vocalisation during the surveys. The species recorded include; Brown Thornbill (*Acanthiza pusilla*), Lewin's Honeyeater (*Meliphaga lewinii),* Bell Miner (*Manorina melanophrys*), Rainbow Lorikeet (*Trichoglossus moluccana*), Eastern Rosella (*Platycercus eximius*), Brown Goshawk (*Accipiter fasciatus*), Australian Magpie (*Cracticus tibicen*), White-winged Chough (*Corcorax melanorhamphos*), Australian Raven (*Corvus coronoides*), Laughing Kookaburra (*Dacelo novaeguineae)*, Pied Currawong (*Strepera graculina*), Black-faced Cuckooshrike (*Coracina novaehollandiae*), Sacred Kingfisher (*Todiramphus sanctus*), Noisy Miner (*Manorina melanocephala*), White-browed Scrubwren (*Sericornis frontalis*), Olive-backed Oriole (*Oriolus sagittatus*), Noisy Friarbird (*Philemon corniculatus)*, Superb Fairy Wren (*Malurus cyaneus*), Grey Butcherbird (*Craticus torquatus*), Yellow-faced Honeyeater (*Lichenostomus chrysops*), Spotted Pardalote (*Pardalotus punctatus*), Eastern Yellow Robin (*Eopsaltria australis*), Red Wattlebird (*Anthochaera carunculata*) and Grey Fantail (*Rhipidura albiscapa*). Additionally, nocturnal bird species Southern Boobook (*Ninox novaeseelandiae*) and Australia Owlet-nightjar (*Aegotheles cristatus*) were also observed.

Herpetofauna

Four reptile species and four amphibian species were recorded during surveys. A Common Garden Skink (*Lampropholis guichenoti*), Red-bellied Black Snake (*Pseudechis porphyriacus*), Blue Tongue Lizard (*Tiliqua scinoides scinoides*) and Lace Monitor (*Varanus varius*) were observed during diurnal surveys. The frog species *Uperoleia fusca* (Dusky Toadlet), Striped Marsh Frog (*Limnodynastes peronii*), Spotted Marsh Frog (*Limnodynastes tasmaniensis*), Common Eastern Froglet (*Crinia signifera*) were recorded during nocturnal surveys and during call playback near the unnamed waterbody.

5.6 Identified Threatened Species

5.6.1 Species Area/Count, and location of suitable habitat for species credit species

The following **Table 11** presents a summary of species area considerations for the subject land. Refer to **Figure 9** and **Figure 10**. A discussion is provided in **Section 5.6.2**.

Table 11 Species Area/Count & Location of Suitable habitat for species credit species

Species	Vegetation Zone	Condition Class	Unit of Measure	Area (ha)/individual (HL)
Myotis macropus (Southern Myotis)	VZ 1	1589_Moderate	Area	0.57
	VZ 3	1589_Low		0.22
	VZ 4	1590_Moderate		0.44
	VZ 5	1590_Low		0.04
			Total Area (ha)	**1.27**
Petaurus norfolcensis (Squirrel Glider)	VZ 1	1589_Moderate	Area	0.58
	VZ 2	1589_Moderate (*A. costata*)		0.21

Species	Vegetation Zone	Condition Class	Unit of Measure	Area (ha)/individual (HL)
	VZ 3	1589_Low		0.40
	VZ 4	1590_Moderate		8.21
	VZ 5	1590_Low		0.37
	VZ 6	1590_Low (*M. nodosa*)		1.73
	VZ 7	1619_Low		0.94
			Total Area (ha)	**12.45**

5.6.2 Determine the habitat condition within the species polygon for species assessed by area

Myotis macropus

All land 200 m of a waterbodies greater than 3 m across was considered potential habitat for the species. In the context of this proposal, one waterbody >3 m with was present within the subject land. Several hollow-bearing trees are present in close proximity to the body of water, therefore suitable breeding habitat is present for the species. The species was detected on both Anabat recorders (detected as '*probable*', see **Appendix I**). Probable detection indicates a low probability of confusion with species that use similar call, therefore a moderate level of confidence can be applied to identification of *M. macropus*.

All native vegetation associated with the species (PCT 1589, 1590 & 1619) within the applied buffer is included within the species polygon. This includes areas of VZ1, VZ3, VZ4 and VZ5.

Petaurus norfolcensis

The species was recorded on a single remote arboreal camera within the subject land. Although the species was only detected within one location, several records are in close proximity to the subject land. As all VZs across the subject land contain appropriate habitat for the species, all native vegetation within the site is deemed suitable habitat.

505 MINMI RD, FLETCHER

FIGURE 9: SPECIES POLYGONS - *MYOTIS MACROPUS*

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- Southern Myotis (*Myotis macropus*) 200m Habitat Buffer
- Myotis macropus Species Polygon

Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

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FIGURE 10: SPECIES POLYGONS - *PETAURUS NORFOLCENSIS*

0 45 90 180

Meters

1:2,700

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Tracks
- Waterbody
- Watercourse
- Petaurus norfolcensis Species Polygon

Vegetation Zones

- VZ1: PCT1589 (Moderate)
- VZ2: PCT1589 (Moderate - *A. costata*)
- VZ3: PCT1589 (Low)
- VZ4: PCT1590 (Moderate)
- VZ5: PCT1590 (Low)
- VZ6: PCT1590 (Low - *M. nodosa*)
- VZ7: PCT1619 (Low)
- Exotic/Not Vegetated

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

6 Potential Prescribed Biodiversity Impacts on Threatened Species

6.1 Habitat for threatened entities

Karst, caves, crevices, cliffs, rocks, and other geological features of significance

Several small rocky outcrops were observed within the subject land, however no geological features of significance occur within the subject land and therefore no impacts to threatened entities are anticipated as a result.

Human made structures

No permanent human-made structures occur within the subject land. The subject land contains a number of abandoned and vandalised vehicles, which were considered for their potential to provide habitat for threatened entities, however due to the high levels of disruption by people utilising the site, i.e., continues vandalisation, burning etc of vehicles, these structures were not considered. Additionally, two culverts exist just outside of the northern boundary of the site. As discussed in **Section 5.3**, the culverts were inspected including a roost watch and no evidence of use by fauna was detected. Therefore, no human-made structures were considered to constitute as a prescribed impact to threatened entities requiring avoidance and minimisation measures.

Non-native vegetation

No large areas of the subject land have been zoned as non-native vegetation. A small patch of cleared vegetation exists within the very north-east corner of the site, consisting of exotic grass cover. Cover of exotic species is present through all vegetation zones, delineated into low or moderate conditions in line with prevalence of exotic cover. Areas of bare ground exist within the subject land boundaries which have been excised from the vegetation mapping. These areas are unlikely to provide important habitat for threatened entities within the locality.

6.2 Habitat Connectivity

The subject land is a part of a large continuous patch of vegetation that currently provides fragmented connectivity in a north-south direction. The patch continues south to contain Blue Gum Hill Regional Park and further west to incorporate Sugarloaf State Conservation Area. However, connectivity of the patch is limited by the presence of the arterial roads the M1 Freeway and Hunter Expressway. Connectivity to the north of the site is dissected by Minmi Road, this connectivity is generally limited to the isolated canopy trees present and open unmanaged pastures. This semi-hostile connection continues south to Hexham Swamp, of which is a part of a large wetland complex to include Shortland Wetlands and Kooragang Nature Reserve. The subject land exists at the very eastern extent of connectivity east-west, with the housing estate of Fletcher present directly east of the site.

Impacts to threatened entities which may rely on vegetation within the subject land to facilitate connectivity within the locality is mitigated by the implementation of a large biodiversity corridor C2 zone through the centre of the subject land. Connectivity of the proposed C2 zoned corridor will be impaired in some measure, however owing to the width of the road corridor, impacts are anticipated to be negligible for all but fauna with highly restricted mobility (See **Section 10.1**). Additionally, the proposal will increase the extent of C2 zoned land within the south of the site to conserve north-south connectivity nested between the current residential infrastructure of Fletcher and the newly established Winten Precinct 1 located west of the site. The proposed C2 connective corridors to be retained through the proposal will likely serve as integral wildlife corridors as Local Housing Strategies are implemented (Greater Newcastle Metropolitan Plan 2036, NSW DPE 2018).

The proposal assumes removal of up to 12.45 ha of native vegetation (1.20 ha PCT 1589, 10.31 ha PCT 1590, 0.94 ha 1619) as a result of the future development of that will be facilitated by the rezoning.

6.3 Water bodies, water quality and hydrological processes that sustain threatened entities

Rivers, Streams, Estuaries and Wetlands

The NSW Hydroline mapping contains two Strahler 1st order streams. As described in **Section 2.1.3**, one stream was confirmed to lie outside of the subject land, therefore only a single 1st order stream occurs within the subject land. Additionally, a single waterbody is nested within the single 1st order stream within the north of the site. The proposed C2 zoning will preserve the extent of the stream and the single permanent waterbody within the subject land, inclusive of riparian buffer required in accordance with Department of Natural Resources Access Regulator (NRAR) specifications. Several ephemeral waterbodies were observed within the subject land following periods of extensive rainfall, some of which will be impacted as a result of the proposal. Potential foraging habitat for the Southern Myotis (*Myotis macropus*) is solely within proposed C2 land, and will not be impacted as result of the proposal.

The Hexham Swamp and Shortland Wetlands exist ~1.5 km north of the subject land. No impacts to the wetland complex are anticipated though the proposal, assuming that adequate mitigation measures are implemented (**Section 12**).

Ground Water Dependent Ecosystems

The Bureau of Meteorology Atlas of Groundwater Dependant Ecosystems (GDEs) for the Hunter River catchment has identified areas of low and moderate terrestrial GDEs within the subject land. No areas of aquatic GDEs were identified within the subject land.

The project does not include the extraction of groundwater; however, contamination from construction operations, could impact on the quality of groundwater if adequate mitigation measures are not taken. It is not anticipated that the proposal will result in impacts to mapped GDEs.

6.4 Wind turbine strikes

Not relevant to the proposal, therefore there are not anticipated prescribed impacts associated.

6.5 Vehicle strikes

It is anticipated that the proposal will result in increased traffic both within the subject land, and within the locality of the subject land as a result of the proposed of R2 zoning. This includes a residential road dissecting the very south of the proposed C2 zoned land, bridging the eastern and western portions of R2 zoned land. The proposal will somewhat increase the likelihood of vehicle strikes as a result of the additional traffic during future works and the establishment of residential estate. The northern boundary of the site abuts Minmi Road, subjecting fauna interacting with the site to high-speed traffic. Future development will consist of residential sealed roads, with conservative residential zone speed limits anticipated to apply. Additionally, peak fauna movement is likely to occur during nocturnal hours when traffic is anticipated to be low. Therefore, increase in the likelihood of vehicle strikes is anticipated to be minimal.

7 Matters of National Environmental Significance

An EPBC Act Protected Matters Search (accessed 28-06-2022) was undertaken to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the subject land. An assessment of those MNES relevant to biodiversity has been undertaken in accordance within EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Listed Threatened Species and Communities:

A total of 83 threatened species, six threatened ecological communities and 64 migratory species listed under the EPBC Act have been recorded on the protected matters search. A likelihood of occurrence assessment for these MNES has been completed in **Appendix G**.

Threatened Species

A total of 34 threatened birds, nine mammals, five amphibians, seven reptiles and 25 plants were recorded on the protected matters search. Of these, five species were considered to have the potential to occur within subject land:

- *Anthochaera phrygia* Regent Honeyeater
- *Dasyurus maculatus maculatus* Spotted-tail Quoll
- *Hirundapus caudacutus* White-throated Needletail
- *Lathamus discolor* Swift Parrot
- *Pteropus poliocephalus* Grey-headed Flying Fox

This assessment concluded that the proposal is unlikely to have significant impacts to any of the listed threatened species (see **Appendix H**).

No Threatened Ecological Communities listed under the EPBC Act have been recorded within the subject land.

Listed Migratory Species:

The protected matters search nominated 64 migratory species or species habitat that may occur with the 10 km subject land buffer search area. No listed migratory species were observed within the subject land. The assessment contained in **Appendix G** a single species was considered to have the potential to occur within subject land:

- *Gallinago hardwickii* Latham's Snipe

This assessment concluded that the proposal is unlikely to have significant impacts to any listed migratory species (see **Appendix H**).

Wetlands of International Significance (declared Ramsar wetlands):

The subject land is not a wetland of international significance or declared Ramsar wetland. Four wetlands of international importance were nominated within a 10 km radius of the Study Area. However, no wetlands of international significance are in close proximity, the subject land is located <2 km south-west of:

- Hunter estuary wetlands

The Hunter Estuary Wetlands Ramsar site supports species that are nationally and internationally listed. Importantly the green and golden bell frog (*Litoria aurea*) listed as vulnerable under the EPBC Act 1999 have been found within the Kooragang component of the Ramsar site. The Australasian bittern (*Botaurus poiciloptilus*) listed as endangered on both the EPBC Act and the IUCN Red List (Version 2009.1) has been found at both components of the Ramsar site.

The Hunter Estuary Wetland Ramsar site supports 112 species of waterbirds and 45 species of migratory birds listed under international agreements, including the great egret (*Ardea alba*), cattle egret (*Ardea ibis*), terns (*Sterna* spp.), glossy ibis (*Plegadis falcinellus*) and white-bellied sea-eagle (*Haliaeetus leucogaster*).

These wetlands also provide refuge for waterbirds such as ducks and herons during periods of inland drought.

The Hunter Estuary Wetland Ramsar site regularly supports 1% of the population of the eastern curlew (*Numenius madagascariensis*) and the red-necked avocet (*Recurvirostra novaehollandiae*),

Commonwealth Marine Areas:

The subject land is not part of a Commonwealth Marine Area and is not in close proximity to any such area.

World Heritage Properties:

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

National Heritage Places:

The subject land is not a National Heritage area and is not in close proximity to any such area.

Great Barrier Reef Marine Parks:

The subject land is not part of or within close proximity to any Great Barrier Reef Marine Park.

Nuclear Actions:

The proposal over the subject land is not and does not form part of a Nuclear action.

Water Resources in relation to Coal Mining and CSG:

The proposal over the subject land is related to commercial development and as such is not or does not form part of a coal mining and/or CSG proposal.

Summary - In summary, the proposed action is unlikely to have an impact to MNES assessed herewith based on the assessment criteria set out in relevant Commonwealth policies and advices as at the time of this assessment.

8 SEPP (Biodiversity and Conservation) 2021

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* commenced on 1 March 2022 and combines 11 separate SEPPs into one consolidated document. SEPP (Biodiversity and Conservation) 2021 replaces and repeals those consolidated SEPPs, which includes amongst others, both the SEPP (Koala Habitat protection) 2020 and SEPP (Koala Habitat protection) 2021. The Biodiversity and Conservation SEPP 2021 provides the existing provisions as separate chapters.

The principles of the Biodiversity and Conservation SEPP 2021 are unchanged from the previous Koala SEPP 2020 and 2021 and aim 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.
- Help reverse the decline of koala populations by ensuring koala habitat is properly considered during the development assessment process.
- Provide a process for councils to strategically manage koala habitat through the development of koala plans of management.

The Biodiversity and Conservation SEPP 2021 reflects the policy framework of previous Koala SEPP 2020 (Chapter 3) and 2021 (Chapter 4) for Local Government Areas (LGA) in NSW. At this stage:

- In nine of these LGAs – Metropolitan Sydney (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA – **Chapter 4** of the Biodiversity and Conservation SEPP 2021 applies to **all zones**.
- In all other identified LGAs, **Chapter 3** of the Biodiversity and Conservation SEPP 2021 **applies** to land zoned RU1 Primary Production, RU2 Rural Landscape or RU3 Forestry.

The SEPP applies in accordance with *Part 4.2 Clause 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

The lot in which the subject land occurs is >1 ha.

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

No koala plan of management occurs within the Newcastle LGA.

Additionally, tree species belonging to the koala use trees species listed in Schedule 3 for the relevant koala management area (Central Coast) occur within the subject land and are subject to the Planning Proposal and therefore assumed to be removed as part of future works. Nine Koala Use Trees Species were determined present within the subject land: *Angophora costata, Corymbia gummifera, C. maculata, Eucalyptus acmenoides, E. fibrosa, E. globoidea, E. punctata, E. siderophloia* and *E. umbra.*

As per Part 3.2 of the SEPP 2021, the Policy only applies to development applications. It is to be noted that the minister may request an environmental study to be prepared with the undertaking of a planning proposal.

9 SEPP (Resilience and Hazards) 2021

The *State Environmental Planning Policy (Resilience and Hazards) 2021* commenced on 1 March 2022 and combines three separate SEPPs into one consolidated document. SEPP (Resilience and Hazards) 2021 replaces and repeals those consolidated SEPPs, which includes amongst others, both the SEPP (Coastal Management) 2018. The Resilience and Hazards SEPP 2021 provides the existing provisions as separate chapters.

The principles of the Resilience and Hazards SEPP 2021, Chapter 2 Coastal Management are unchanged from the previous principles addressed within the Coastal Management SEPP 2018. These principles are as follows:

a) Resilience and Hazards SEPP 2021 defines the coastal zone and establishes state-level planning priorities and development controls to guide decision-making for development within the coastal zone.
b) It promotes an integrated and coordinated approach to land use planning in the coastal zone, that is consistent with the objects of the Coastal Management Act 2016 (the Act).

As per Section 5 of the Coastal Management Act 2016, the site is considered within the proximity area for coastal wetlands and therefore falls under the policy framework of the SEPP (Coastal Management) 2018.

The north-western boundary of the subject land lies within the proximity area for coastal wetlands on the Coastal Wetlands and Littoral Rainforests Map within the SEPP. As per Division 2.2.1, section 2.8 (1) Development consent must not be granted to development on land identified as “proximity area for coastal wetlands” or “proximity area for littoral rainforest” on the Coastal Wetlands and Littoral Rainforests Area Map unless the consent authority is satisfied that the proposed development will not significantly impact on:

a. The biophysical, hydrological or ecological integrity of the adjacent coastal wetland or littoral rainforest, or;
b. The quantity and quality of surface and ground water flows to and from the adjacent coastal wetland or littoral rainforest.

The proposal is unlikely to impact the biophysical, hydrology or ecological integrity of the adjacent wetland, (a) and (b). The proposal will retain connectivity to the wetland complex within the locality through the implementation of C2 zoned land. The core of the subject land will hold a biodiversity corridor, running north-south through the site towards the wetland complex. Indirect and prescribed impacts of the proposal are quantified and addressed within this document as per the BOS through the application of the BAM (2020). Ensuring all impacts are mitigated as per the avoid and minimise hierarchy.

The proposal will not impact any coastal lakes listed under Schedule 1 *Coastal Lakes* of the SEPP.

STAGE 2 - IMPACT ASSESSMENT

10 Avoid and Minimise Impacts

10.1 Biodiversity Values

Avoid and minimise measures have been incorporated into the proposal as per the avoid and minimise and offset hierarchy (as per BAM Section 7.1 and 7.2). Potential biodiversity impacts have been considered over the lifetime of the project through initial site selection, throughout the iterative design process as a component of the proposed Planning Proposal which considers future developments. The avoidance and minimisation measures applied to this proposal are addressed below, by first assessing site selection inclusive for the Planning Proposal associated with the BCAR and then through the iterative design process over the project lifetime. The BCAR demonstrates that the proposal has been considered from an economic, social and environmental impact perspective and that the zoning boundary establishes an ecologically sustainable development consistent with the purpose of the BC Act 2016

The proposed rezoning has been endorsed by the Hunter Central Coast Regional Planning Panel, deem to have both strategic and site specific merit. The panel recognised the proposal to incorporate residential opportunities with while showing dedication to safeguard biodiversity values within the locality. The historical strategic value of the site that falls outside of the identified Watagan Stockton Green Corridor along with Hunter Regional Plan 2041 and Greater Newcastle Metropolitan 2036 have been considered during the site selection and project design process.

Site Selection

The subject land is located within Fletcher on the very outer region of the Newcastle LGA, closely bordered by Cessnock LGA to the west and Lake Macquarie LGA to the south. The northern boundary of subject land abuts Minmi Road and housing estate of Fletcher to the east. Owing to historic and active residential development within the surrounds, the site was identified as a Planned Future Development Site within the Section 7.11 Western Corridor Local Infrastructure Contributions Plan 2013 (NCC 2020c). Additionally, the site was highlighted as a Planned Future Development Site within Section 7.11 of the Western Corridor Local Infrastructure Contribution Plan (2013), of which was endorsed by Newcastle City Council in February 2020.

The subject land is currently zoned solely as C4 Environmental Living, with established residential estate directly east and north of the site. Additionally, R2 Low Density Residential zoned land abuts the western boundary and is at the forefront of future development within the locality. A small strip of C2 Environmental Conservation spans the southern boundary, transitioning south to SP2 Infrastructure Water Resource Management. The proposal will see to increase C2 zoned land within the core of the lot and expand the extent within the very south, securing links between existing C2 land to the Hunter Wetland Complex north of the lot. The site contains areas of important biodiversity values such as the presence of an EEC and habitat for the *Myotis macropus* and *Petaurus norfolcensis*. The proposed C2 land will encapsulate all potential foraging habitat for the *M. macropus* (waterbodies >3 m), and retain 13.02 ha of habitat for the *P. norfolcensis* and EEC *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* listed under the BC Act.

Biodiversity Corridors

As discussed previously, the proposed zoning has considered a number of strategic plans such as the Hunter Regional Plan 2041and the Greater Newcastle Metropolitan Plan 2036 during the site selection process. All plans reiterate the importance of retaining Biodiversity Corridors and incorporating future local and regional plans to retain recognised keystone corridors. The proposal does not fall within the Watagan to Stockton Link, the principal corridor within the locality originally established by the Lower Hunter Regional Strategy 2006 and subsequently incorporated within Hunter Regional Plan, Greater Newcastle Metropolitan Plan 2036 and Newcastle – Lake Macquarie Western Corridor Planning Strategy 2010.

Under the current zoning, the subject land sits solely on C4 Environmental Living. The design of the proposed rezoning will see the retention of 13.14 ha of native vegetation, which will be rezoned as C2 Environmental Conservation land, totally 13.54 ha. Chiefly, the C2 land is located through the centre of the subject land, inclusive of the northern riparian area. The 11.12 ha patch of vegetation will provide a north-south connectivity corridor to facilitate fauna movements. The connectivity corridor will connect vegetation conserved in C2 zoned land of the subject land to a semi-fragmented landscape (north of Minmi Road) of scattered canopy trees and unmanaged pasture, of which is contiguous with the southern areas of Hexham Swamp. Hexham Swamp is recognised as a Nationally Important Wetland (DCCEEW 2017), harbouring habitat that regularly supports an abundance of waterbirds and migratory birds. The wetland is a part of a larger complex of wetlands inclusive of Shortland Wetland and Kooragang Nature Reserve, which are also recognised as important habitat for State, Federal and internationally listed fauna. The connection is limited by the presence of Minmi Road, which presents as a hostile connection, though the connection remains for mobile species. The implementation of a residential road is required to bridge the north-east and south-west R2 parcels of land to facilitate future residential development, located south of the C2 corridor. The road will be located on the extent of an existing fire trail bordering the very south of the site, therefore the magnitude of fragmentation will be minimal.

Forest south of the proposed C2 zoned land will facilitate local corridor connectivity. This corridor will also support connectivity for lands adjacent to the recently completed development to the south-east and works currently under construction to the west. The proposed linking road between the R2 zoned precincts is unlikely to impair faunal dispersal as species with highly restricted mobility are unlikely to require access to habitat south of the proposed road. The linking road poses negligible impacts to the dispersal of mobile species such as forest owl or arboreal mammals. The proposed road will be no wider than 17 m (See **Appendix K**), allowing adequate distance travel for species such as *Petaurus norfolcensis* individuals. As per **Appendix K**, the cross-section depicts that there will be no more than 2 m (ALS) of variation in elevation in the road reserve and likely the mature and semi-mature *Eucalyptus* species present at the boundary of the reserve will prove a sufficient height for gliding in both directions. While not anticipated, in the event that canopy is not present to a sufficient height to accommodate gliding travel distance, and subject to a post clearing gap analysis, glider poles combined with select tree planting may be relied upon to augment and secure connectivity.

Additionally, the proposal will preserve 1.95 ha of native vegetation within the southern extent of the subject land through the zoning of C2 land. This will add to the extent of existing C2 land which poses as a main corridor between the current residential infrastructure of Fletcher and the newly established Winten Precinct 1 located west of the site. This connection will provide a habitat corridor for mobile species dispersing south to a larger continuous patch of intact vegetation or north to the wetland complexes described above. The proposed C2 connective corridors to be retained through the proposal will likely serve as integral wildlife corridors as Local Housing Strategies are implemented (Greater Newcastle Metropolitan Plan 2036, NSW DPE 2018).

Habitat to be conserved within the connection corridor of C2 land falls steeply below Minmi Road in a west and north westerly direction via three defined gullies and drainage lines, which converge together in the subject land's north-west corner. As described in **Section 2.1.3**, 1st order stream located within the study area's north-west will be retained under this proposal, the ephemeral stream is holds water during high rainfall events. Additionally, a waterbody >3m wide nested within the course of the stream will be retained through the proposal. The waterbody and ephemeral stream serve as habitat for amphibian, avian and microchiropteran bat species. Areas within the gully's contain high to moderate levels of *Lantana camara* infestations, limiting faunal movements for less mobile species. The remainder of habitat to be conserved within south of the subject land contains moderate variants of PCT 1589 and 1590, harbouring hollow-bearing trees and logs/leaf-litter suitable for fauna such as arboreal/terrestrial mammals, reptiles, birds.

Though the proposed rezoning does not facilitate connectivity between the north eastern residential precinct and the C2 Environmental Conservation zoning north of Minmi Road, northeast of the subject land; nor the linear C2 zoning extending north of Minmi Road to the northwest of the subject land. Both areas of extant C2 zoning are tenuously contiguous due to the hostile bisection of Minmi Road running west to east across of the subject land. The wooded portion of the north western C2 zoned area terminates approximately 380 m north of Minmi Road, becoming a patchwork of historic agricultural land.

The northeastern area of C2 zoned land dips steeply in elevation north of Minmi Road, from approximately 45 m ASDL to 36 m at the tree line. The C2 zoned area is functionally a drainage depression dropping to 3 m at its lowest point. Though the drainage line provides potential habitat for some entities, there are no Bionet Records for species such as amphibians within 1500 m of the subject land. Therefore the C2 zoned at present likely only provides habitat connectivity for highly mobile fauna such as avian species.

Considerations of potential impacts to threatened species and threatened ecological communities are listed as follows:

Threatened species

The subject site contains confirmed habitat for two listed species; the Southern Myotis (*Myotis macropus)* and Squirrel Glider (*Petaurus norfolcensis*) both listed as vulnerable under the BC Act. Opportunities to retain habitat for the threatened entities with the potential or known to utilise the site have been considered. The majority of the species polygon for *M. macropus* is captured within the proposed C2 zoning to the north and south of the site, ensuring that impacts to the species are minimised (as discussed in Section 5.6.2).

Potential habitat use by Squirrel Gliders (*Petaurus norfolcensis*) occurs across the entirety of the subject site, with the species identified via passive detection methods (as per Section 5.6.2). Suitable habitat for this entity is present across the entirety of the site, with the species polygon only excluding areas not proposed to be impact (being all areas of proposed R2 zoning). Therefore, the areas of C2 zoning is securing suitable habitat for the species within the subject land, ensuring movement across the site via the southern and south-eastern corridor connecting to abutting lands. Connectivity is also maintained via connection to the north to the C2 zoned land, albeit by the more hostile connection of Minmi Rd. Amelioration measures such as glider poles between the development site and adjoining lands may be installed, following a glider gap analysis, to ensure fauna movement is retained however this would need to be determined and implementation as part of post approval works in association with eventual Conditions of Consent and therefore not determined here within impact assessment.

The total retained area of suitable habitat for the entity is 10.34 ha, which is approximately 39.42% of the subject land. The Lake Macquarie Squirrel Glider Planning Management Guideline (2015) states that a patch of 4 ha is required, at a minimum, to maintain permanent occupancy by the species, therefore utilisation of the site by the species is able to persist under the current proposed rezoning and move across the landscape to larger patches of C2 zoned lands.

Threatened Ecological Communities (TEC)

The subject land contains approximately 15.22 ha of Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions which is a BC Act listed Endangered Ecological Community (EEC). A total of 4.91 ha of the EEC will be avoided, while 10.31 ha will be impacted across the R2 zoning and proposed road. The revisions to the rezoning boundaries have increased the area of retained EEC from 3.48 ha, marking an increase of protected EEC areas by 1.43 ha or 41.09%. Although it is acknowledged that up to 10.31 ha of the EEC will be impacted by the proposal, the patch will retain ecological functionality through the areas conserved.

Project Design

The rezoning boundary between areas of R2 Low Density Residential and C2 Environmental Conservation has shifted over the project lifetime: from the initial September 2020 submission; amendment to zoning boundary which included the C2 area to the south and increase to the central C2 area; and, finally to the 2023 proposed zoning boundary which includes a further increase to the southern C2 zoning.

The relative areas of each zoning boundary amendment are included in **Table 12** below and depicted within **Appendix M**. The proposed area of C2 zoning has increase from the initial 41.17% of the subject land in the 2020 submission, to 51.61% making a 10.43% increase in C2 zoned land under the current proposal. As described above, **Section 10.1 *Biodiversity Conservation***, amendments to C2

boundaries have been made over time to increase utilisation and connectivity with the C2 areas adjacent to the subject land.

Table 12 Amendments to rezoning boundaries

Year	Land Zoning	Area (ha)
2023 Proposal	C2: Environmental Conservation	13.54
	R2: Low Density Residential	12.69
2022 Amendment	C2: Environmental Conservation	12.99
	R2: Low Density Residential	13.24
2020 Submission	C2: Environmental Conservation (previously E2)	10.80
	R2: Low Density Residential	15.43

The proposal for the BCAR is inclusive of the intended future developments, as indicated by the accompanying Planning Proposal. The proposed rezoning will result in 12.69 ha of R2 Low Density Residential and 13.54 ha of C2 Environmental Conservation, as listed above (**Table 12**). Future development across the site will be indicative of the proposed rezoning including the establishment of a low density residential estate within areas zoned as R2. Additionally, a residential road will run along the south-eastern boundary of the lot, connecting the two R2 parcels of land. Although a portion of C2 land will be modified as a result of the road, it is primarily positioned along an existing firetrail.

The subject land contains 25.47 ha of native vegetation within the subject land (26.23 ha). Under the proposed project design for the BCAR, total loss of vegetation is assumed within the rezoned R2 and within the proposed access road connecting the parcels of R2 areas across the C2 land. The impacts to vegetation are as follows:

- PCT 1589 1.20 ha
- PCT 1590 10.31 ha
- PCT 1619 0.94 ha

Areas identified for future development (R2 land) occur within zones fragmented by firetrails and bike tracks, which are often subject to activities such as illegal dumping's and dirt bikes/4WD use. The project design utilises this portion of the site to encompass areas most vulnerable to future disturbance and degradation. The core portion of the proposed C2 land is chiefly void of access tracks and is subject to less interaction with the public, however HTE *Lantana camara* is prevalent throughout the zone. Nonetheless the canopy is intact and will continue to provide foraging habitat for mobile threatened species such as *Petaurus norfolcensis* and *Pteropus poliocephalus* which were detected utilising the site. The only source of foraging habitat for *Myotis macropus* will be retained within the C2 zoning, in the form of a waterbody spanning >3 m. Additionally, it will see to retain 4.91 ha of EEC *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions* listed under the BC Act. Project design for this proposal has been an iterative process. Consultation between the planners and ecologist has been collaborative. and taken key consideration of the purpose of the BC Act 2016, being to establish ecologically sustainable development. The proposed rezoning over the Lot was produced in accordance with BAM requirements including avoiding and minimising biodiversity impacts as much as practicably possible. Avoidance of the core of the site with the rezoning of C2 zoned land aims to retain connectivity within the broader landscape and preserving waterbodies within the subject land. The introduction of C2 zoned land within the core of the site, and the extension of C2 land within the south provides avoidance to threatened entities and associated biodiversity where possible.

Assessment of the C2 Environmental Conservation to determine the feasibility of the establishing a Biodiversity Stewardship Site (BSS) as a Private Land Conservation Agreement (PLC) under Part 5 of the BC Act (2016) has been undertaken. A Biodiversity Stewardship Agreement over the land is not appropriate due to size of the land parcel as determined by the potential for it to generate suitable biodiversity credit gains over time as described by BAM Operations Manual – Stage 3 (2020), as well as the costing and management actions required by the Ecological Monitoring Manual (EMM) 2022. Given the size and site constraints associated with the proposed land a rezoning for Environmental Conservation such as the proposed C2 zoned land is most appropriate. The land will be managed via the application of a Management Plan, with the opportunity to dedicate the land to Council, or if a

community title subdivision is pursued, the Management Plan will be implemented under the community arrangement.

Refer to **Figure 11** showing the proposed rezoning of the subject land, **Appendix M** shows Amendments to rezoning boundaries over the project lifetime.

10.2 Prescribed Biodiversity Impacts

The avoidance and minimisation of prescribed biodiversity impacts is a critical component of the BAM, as many of these biodiversity values are difficult to quantify, replace or offset.

The BC regulation (clause 6.1) identified actions that are prescribed as impacts to be assessed under the biodiversity offset scheme. Where these items occur, they have been addressed below.

10.2.1 Habitat for Threatened Entities

Karst, caves, crevices, cliffs, rocks, and other geological features of significance

Several small rocky outcrops were observed within the subject land, however no geological features of significance occur within the subject land and therefore no impacts to threatened entities are anticipated as a result.

Human-made structures

No permanent human-made structures occur within the subject land. The subject land contains a number of abandoned and vandalised vehicles, which were considered for their potential to provide habitat for threatened entities, however due to the high levels of disruption by people utilising the site, i.e., continued vandalisation, burning etc of vehicles, these structures were not considered. Additionally, two culverts exist just outside of the northern boundary of the site. As discussed in **Section 5.3**, the culverts were inspected including a roost watch, no evidence of use by fauna was detected. Therefore, no human-made structures were considered to constitute as a prescribed impact to threatened entities requiring avoidance and minimisation measures.

Non-native vegetation

As per section 6.1, no areas large areas of the subject land have been zoned as non-native vegetation. A small patch of cleared vegetation exists within the very north-east corner of the site, consisting of exotic grass cover. Cover of exotic species is present through all vegetation zones, delineated into low or moderate conditions in line with prevalence of exotic cover. Areas of bare ground exist within the subject land boundaries which have been excised from the vegetation mapping. These areas are unlikely to provide important habitat for threatened entities within the locality, therefore no avoidance or minimisation measures are required.

10.2.2 Habitat Connectivity

As discussed in **Section 6.2**, the subject land is a part of a large continuous patch of vegetation that currently provides fragmented connectivity in a north-south direction. The patch continues south to contain Blue Gum Hill Regional Park, and ultimately to incorporate Sugarloaf State Conservation Area. Connectivity to the north of the site is fragmented by Minmi Road, the semi-hostile connection continues south to Hexham Swamp, of which is a part of a large wetland complex to include Shortland Wetlands and Kooragang Nature Reserve. The land parcel exists as the very eastern extent of connectivity east-west, with the housing estate of Fletcher present directly east of the site.

The proposal will reduce the extent of the larger continuous patch of vegetation by up to 12.45 ha as a result of the proposed zoning. This includes fragmentation to the very northern portion of the larger patch with the implementation of R2 land within subject land, however connectivity will be retained within the wider landscape through the implementation of a large biodiversity corridor through the centre of the subject land. Connectivity of the proposed C2 zoned corridor will be impaired in some measure, however owing to the width of the road corridor, impacts are anticipated to be negligible for all but fauna with highly restricted mobility (See **Section 10.1**). Additionally, the proposal extends the

C2 zoned land within the south of the site to conserve connectivity between the current residential infrastructure of Fletcher, and the newly established Winten Precinct 1 located west of the site.

Impacts to threatened entities within the locality of the subject land will be mitigated by the implementation of the C2 zoned land. The proposed C2 connective corridors to be retained through the proposal will likely serve as integral wildlife corridors (see **Section 10.1**).

10.3 Water bodies, Water Quality and Hydrological Processes that Sustain Threatened Entities

Rivers, Streams, Estuaries and Wetlands

As described in **Section 6.2**, the subject land contains one Strahler 1st order stream within the north of the site, of which a single waterbody is nested within. The proposed C2 zoning will preserve the extent of the stream and the single permanent waterbody within the subject land, inclusive of riparian buffer required in accordance with Department of NRAR specifications. The proposal will mitigate impacts to threatened entities by the retention of the waterbody, preserving foraging habitat for threatened species such as the Southern Myotis (*Myotis macropus*). The waterbody and ephemeral stream sit within the middle of the C2 zoned land, it is not anticipated that these waterbodies will be subject to indirect impacts through future development within the R2 zoned land.

Several ephemeral waterbodies were observed within the subject land following periods of extensive rainfall, areas suitable to form ephemeral waterbodies will be impacted as a result of the proposal.

The subject land is located ~1.5 km south of the Hunter Wetland complex; the complex containing wetlands recognised as either a Nationally Important Wetland or a Ramsar listed. The complex is recognised as a Migratory Shorebird Important Area. Prescribed impacts to the wetland complex and surrounding waterbodies will be mitigated through the implementation of retention basins. Retention basins will store and release water collected from the future residential development located in areas likely to traffic run-off ensuring that impacts the hydrological process of the subject land resultant from the proposal are mitigated.

Ground Water Dependent Ecosystems

As described in **Section 6.2**, the subject land contains areas of low and moderate terrestrial GDEs within the subject land. No areas of aquatic GDEs were identified within the subject land. The project does not include the extraction of groundwater; however, contamination from construction operations, could impact on the quality of groundwater if adequate mitigation measures are not taken. It is not anticipated that the proposal will result in impacts to mapped GDEs.

10.3.1 Wind Turbine Strikes

Not relevant to the proposal, therefore no avoidance and minimisation is required.

10.3.2 Vehicle Strikes

As described in **Section 6.2**, It is anticipated that the proposal will result in increased traffic both within the subject land, and within the locality of the subject land as a result of the proposed of R2 zoning. This includes a residential road dissecting the very south of the proposed C2 zoned land, bridging the eastern and western portions of R2 zoned land. The proposal may increase the likelihood of vehicle strikes as a result of the additional traffic during future works and the establishment of residential estate. However the future development will consist of residential sealed roads and formal conservative speed limits. The subject land currently experiences illegal vehicle activity, where no formal roads exist, or speed limits are enforced. Therefore, increase in the likelihood of vehicle strikes is anticipated to be minimal.

11 Unavoidable Impacts

The following section outlines potential direct and indirect impacts on biodiversity values and prescribed impacts associated with the amended proposal.

11.1 Direct Impacts

The proposed Biocertification over land of Lot 23 DP 1244350 505 Minmi Road, Fletcher, NSW to facilitate the future development will result in the following direct impacts:

Removal of Native Vegetation & TEC

Up to a total of 12.45 ha of native vegetation is assumed to be removed as the result of the proposed rezoning of the land. **Table 13** provides an overview of the area to be cleared and the current and future vegetation integrity score (V.I).

Of this 10.31 ha of PCT 1590 is to be removed which is commensurate with BC Act listed EEC *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*.

Removal of Threatened Species (Candidate Species Credit Species)

- *Myotis macropus* – (1.27 ha loss of habitat);
- *Petaurus norfolcensis* (12.45 ha loss of habitat)

Table 13 Direct Impacts on Native Vegetation

Vegetation Zone	Condition	Threatened Ecological Community	Area (ha)	Current V.I Score	Future V.I Score
1589: Spotted Gum – Broad-leaved Mahogany – Grey Gum – Shrub open forest on Coastal Lowlands of the Central Coast					
VZ1	1589_Moderate	No	0.58	81.9	0
VZ2	1589_Moderate (*A. costata*)	No	0.21	64.4	0
VZ3	1589_Low	No	0.40	72.9	0
1590: Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest					
VZ4	1590_Moderate	Yes	8.21	81.9	0
VZ5	1590_Low	Yes	0.37	75.3	0
VZ6	1590_Low (*M. nodosa*)	Yes	1.73	50.7	0
1619: Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands					
VZ7	1619_Low	No	0.94	56.4	0

Candidate Species Credit Species and SAII

As part of the biodiversity assessment, it has been determined the proposal will:

- Not impact any threatened ecological communities which are listed as a candidate Serious and Irreversible Impact entity in accordance with *Guidance to assist a decision-maker to determine a serious and irreversible impact* (BAM 2020)
- Will not impact any threatened species which is listed as a candidate Serious and Irreversible Impact entity in accordance with *Guidance to assist a decision-maker to determine a serious and irreversible impact* (BAM 2020).
- **Will** impact Candidate Species habitat for *Myotis macropus* and *Petaurus norfolcensis* as observations of these species were recorded during formal surveys within the subject land.

11.2 Indirect Impacts

The proposed Biocertification over land of Lot 23 DP 1244350 505 Minmi Road, Fletcher, NSW to facilitate the future development may result in the following indirect impacts described in **Table 14**.

Table 14 Potential Indirect Impacts

Impact	Extent	Frequency/likeliness	Duration	Threatened species or TEC likely to be affected	Consequence of the impact on bioregional persistence of the threatened species, TEC and/or habitat
Inadvertent impacts on adjacent habitat or vegetation	Immediate surrounds	Likely – Ongoing	During & post construction	▪ Hollow bearing trees used by threatened species such as birds, forest owls, microbats and arboreal mammals (potential to occur). ▪ Southern Myotis foraging and potential breeding habitat within the retained C2. ▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	▪ Risk of disturbance of genetic exchange between flora species ▪ Risk of disturbance to retained vegetation ▪ Risk of loss/disturbance to fauna habitat (nests, foraging habitat) ▪ Minor risk of injury or mortality of fauna during clearing within the subject land ▪ Risk of disturbance to retained ephemeral watercourse and waterbody.
Reduced viability of adjacent habitat due to edge effects	Immediate surrounds	Likely – Ongoing	During & post construction	▪ Hollow bearing trees used by threatened species such as birds, forest owls, microbats and arboreal mammals (potential to occur). ▪ Southern Myotis foraging and potential breeding habitat within the retained C2. ▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	▪ Increase in weed dispersal via seed dispersal from proposed developments, construction machinery, increased vehicle and human traffic flow nearby. ▪ Disturbance likely to native flora and fauna habitat along the boundaries and any retained vegetation within the development site. ▪ Disturbance to adjacent HBTs. ▪ Potential disturbance via erosion and sediment flows to retained adjacent vegetation ▪ Increased edge effect may have an impact on accessibility to native vegetation for threatened species
Reduced viability of adjacent habitat due to noise, dust or light spill	Immediate surrounds	Likely - On-going	On-going during construction	▪ Hollow bearing trees used by threatened species such as birds, forest owls, microbats and arboreal mammals (potential to occur).	▪ Alter fauna behaviour (breeding, roosting and movement) in the immediate locality

Impact	Extent	Frequency/likeliness	Duration	Threatened species or TEC likely to be affected	Consequence of the impact on bioregional persistence of the threatened species, TEC and/or habitat
			and post development	▪ Southern Myotis foraging and potential breeding habitat within the retained C2. ▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	▪ Dust cover may impact function of flora species in immediately adjacent vegetation ▪ Alter recruitment dynamics of flora species ▪ Increased light in the locality impacting on nocturnal fauna movements.
Transport of weeds and pathogens from the subject land to adjacent vegetation	Immediate surrounds	Likely - On-going	During construction and post construction: particularly adjacent to the subject land boundary	▪ All threatened flora and fauna known to reside within the area ▪ Southern Myotis foraging and potential breeding habitat within the retained C2. ▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	▪ Mortality and degradation of adjacent vegetation from disease, ▪ Increase risk in weed presences, that will restrict native flora establishment and colonisation and native fauna movements, ▪ Risk of establishment of high threat weed that would degrade native vegetation ▪ Loss of fauna habitat
Increased risk of starvation, exposure and loss of shade or shelter	Immediate surrounds	Initial development stages	Construction stage only	▪ All threatened flora and fauna known to reside within the area ▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	▪ Impact on potential habitat during construction by exposing edges of vegetation that were not accustom to loss of shade or direct environmental factors (increased wind, sunlight) ▪ Minor risk of loss due to exposure of root balls of retained trees during construction ▪ Minor risk of loss of retained individuals via compaction of soils in the immediate area of the root zone
Increase in pest animal populations	Unknown	Likely - Ongoing	During construction and post construction	▪ All threatened flora and fauna known to reside within the area ▪ Southern Myotis foraging and potential breeding habitat within the retained C2.	▪ Minor increase in mortality of threatened fauna species due to pest animal presences. ▪ Minor increase in native vegetation degradation associated with pest animals

Impact	Extent	Frequency/likeliness	Duration	Threatened species or TEC likely to be affected	Consequence of the impact on bioregional persistence of the threatened species, TEC and/or habitat
				▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	foraging on native flora species, ground disturbance ▪ Moderate risk of increasing weed presences within adjacent vegetation by acting as a vector of weed species. ▪ Risk of pest animal population excluding threatened fauna due to favourable modification of vegetation (clearing)
Erosion and sediment impacts to adjacent vegetation	Unknown	Infrequent pending mitigation measures	Construction and Operational	▪ All threatened flora and fauna known to reside within the area ▪ Southern Myotis foraging and potential breeding habitat within the retained C2. ▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	▪ Erosion and sedimentation impact on potential adjacent native vegetation ▪ Erosion and sedimentation impact on potential retained riparian zone
Exposure of known soil contamination from development site into adjacent lands	Unknown	Likely - Ongoing	During construction and post construction	▪ All threatened flora and fauna known to reside within the area ▪ Southern Myotis foraging and potential breeding habitat within the retained C2. ▪ Retained C2 and Adjacent EEC – (PCT 1590) – Lower Hunter Spotted Gum Ironbark Forest.	▪ Risk of contamination exposure impacting health of native vegetation reducing extent and quality, ▪ Risk of contamination exposure impacting biochemistry of ephemeral pools required for amphibian species

11.3 Prescribed Biodiversity Impacts

The proposed Biocertification over land of Lot 23 DP 1244350 505 Minmi Rd, Fletcher, NSW to facilitate the future development result in the following prescribed biodiversity impacts described below:

Karst, caves, crevices, cliffs, rocks, and other geological features of significance

Several small rocky outcrops were observed within the subject land, however no geological features of significance occur within the subject land and therefore no impacts to threatened entities are anticipated as a result.

Human-made structures

No permanent human-made structures occur within the subject land. The subject land contains a number of abandoned and vandalised vehicles, which were considered for their potential to provide habitat for threatened entities, however due to the high levels of disruption by people utilising the site, i.e., continues vandalisation, burning etc of vehicles, these structures were not considered. Additionally, two culverts exist just outside of the northern boundary of the site. As discussed in **Section 6 and Section 10.2**, the culverts were inspected including a roost watch, no evidence of use by fauna was detected. No human-made structures were considered to constitute as a prescribed impact to threatened entities, and therefore no impacts to biodiversity are anticipated.

Non-native vegetation

Minimal areas of the subject land have been zoned as containing non-native vegetation. Cover of exotic species was present through all vegetation zones, however exotic presence is incorporated within the assigned PCT (**Section 6** and **Section 10.2**). No impacts are anticipated to non-native vegetation outside of exotic species present within the identified impact areas.

11.4 Habitat Connectivity

As discussed in **Section 6** and **Section 10.2**, the subject land is a part of a large continuous patch of vegetation that currently provides fragmented connectivity in a north-south direction. The patch continues south to contain Blue Gum Hill Regional Park, and ultimately to incorporate Sugarloaf State Conservation Area. Connectivity to the north of the site is fragmented by Minmi Road, the semi-hostile connection continues north to Hexham Swamp, which is a part of a large wetland complex to include Shortland Wetlands and Kooragang Nature Reserve. The land parcel exists as the very eastern extent of connectivity east-west, with the residential estate of Fletcher present directly east of the site.

The proposal will reduce the extent of the larger continuous patch of vegetation by up to 12.69 ha as a result of the proposed zoning. This includes fragmentation to the very northern portion of the larger patch with the implementation of R2 land within subject land, however connectivity will be retained within the wider landscape through the implementation of a large biodiversity corridor through the centre of the subject land. Connectivity of the proposed C2 zoned corridor will be impaired in some measure, however owing to the width of the road corridor, impacts are anticipated to be negligible for all but fauna with highly restricted mobility (See **Section 10.1**). Additionally, the proposal will extend the extent of C2 zoned land within the south of the site to conserve connectivity between the current residential infrastructure of Fletcher and the newly established Winten Precinct 1 located west of the site.

Habitat connectivity for threatened entities will largely be retained through the proposal with the implementation of the C2 zones, retaining known habitat for threatened species including the Southern Myotis (*Myotis macropus*), and partial habitat for the Squirrel Glider (*Petaurus norfolcensis*) and Grey-headed Flying-fox (*Pteropus poliocephalus*).

The proposal assumes impacts of up to 12.45 ha of native vegetation (1.20 ha PCT 1589, 10.31 ha PCT 1590 and 0.94 ha PCT 1619) as a result of the proposed rezoning and subsequent future development. Therefore, these impacts are unavoidable.

11.5 Water bodies, Water Quality and Hydrological Processes that Sustain Threatened Entities

Rivers, Streams, Estuaries and Wetlands

As described in **Sections 2.1.3, 6.2** and **10.2**, the subject land contains one Strahler 1st order stream within the north of the site, of which a single waterbody is nested within. The proposed C2 zoning will preserve the extent of the stream and the single permanent waterbody within the subject land, inclusive of riparian buffer required in accordance with NRAR specifications. The proposal will mitigate impacts to threatened entities by the retention of the waterbody, preserving foraging habitat for threatened species such as the Southern Myotis (*Myotis macropus*). The waterbody and ephemeral stream sit within the middle of the C2 zoned land, it is not anticipated that these waterbodies will experience indirect impacts through future development within the R2 zoned land.

Several ephemeral waterbodies were observed within the subject land following periods of extensive rainfall, several areas of suitable to form ephemeral waterbodies will be impacted as a result of the proposal.

The subject land is located ~1.5 km south of the Hunter Wetland complex, a complex containing wetlands recognised as either a Nationally Important Wetland or a Ramsar listed wetland. The complex is recognised as a Migratory Shorebird Important Area. No impacts to the complex are anticipated through the proposal.

Ground Water Dependent Ecosystems

As described in **Section 6** and **Section 10.2**, the subject land contains areas of low and moderate terrestrial GDEs within the subject land. No areas of aquatic GDEs were identified within the subject land. The project does not include the extraction of groundwater; however, contamination from construction operations, could impact on the quality of groundwater if adequate mitigation measures are not taken. It is not anticipated that the proposal will result in impacts to mapped GDEs.

11.5.1 Wind Turbine Strikes

Not relevant to the proposal, therefore no unavoidable impacts are anticipated.

11.5.2 Vehicle Strikes

As described in **Section 6** and **Section 10.2**, it is anticipated that the proposal will result in increased traffic both within the subject land, and within the locality of the subject land as a result of the proposed of R2 zoning. This includes a residential road dissecting the very south of the proposed C2 zoned land, bridging the eastern and western portions of R2 zoned land. The proposal may increase the likelihood of vehicle strikes as a result of the additional traffic during future works and the establishment of residential estate. However, the future development will consist of residential sealed roads and formal conservative residential speed limits. The subject land currently experiences illegal vehicle activity, where no formal roads exist, or speed limits are enforced. Therefore, increase in the likelihood of vehicle strikes is unavoidable however anticipated to be minimal.

12 Mitigation and Managing Impacts

The following section outlines general mitigation measures required to manage impacts associated with the future developments that will be facilitated by the BCAR. All mitigation measures propose to manage impacts that include techniques, timing, frequency and responsibility for implementing each measure.

Table 15 Mitigation Measures

Mitigation Measures	Responsibility	KPI	Timing	Corrective Action
Direct Impacts				
Vegetation Clearing				
Vegetation removal works are to occur outside core breeding periods for species known to use habitat on site wherever possible.	Project ecologist in consultation with project manager	Works plan indicates tree clearing areas during optimal months	Summer	Cease site works, revert to KPI
Pre-clearance survey of trees to be removed	Project Ecologist	Tree pre-clearance survey completed maximum one week prior to removal. No breeding fauna observed at time of clearing	Prior to commencement of works for each stage	Cease site works, revert to KPI
Mark habitat trees	Project Ecologist	All habitat trees flagged and determined fauna presences (utilisation)	Prior to commencement of works for each stage	Cease site works, revert to KPI
Under scrubbing of vegetation and removal of non-habitat trees to occur in a sequence to allow for resident fauna to move to adjacent areas of habitat	Project ecologist in consultation with project manager	CEMP to be developed to outline clearing plan for each stage, that includes fauna management	Prior to commencement of works for each stage	Cease site works, revert to KPI
Habitat Tree Removal				
Clear hollow-bearing and habitat trees remaining on Site	Contractors	Trees soft-felled or similar method used	During clearing works for each stage	Cease site works and refer to KPI and timing of activities
Felled trees left in situ before stockpiling to allow for any fauna to move on	Contractors	Trees left overnight after felling, stockpiled within clearing boundary	After felling of hollow-bearing and habitat trees, prior to stockpiling	Cease site works and refer to KPI and timing of activities
Felling supervised by Ecologist	Project Ecologist	Tree hollows checked for fauna Fauna welfare managed in accordance with ethic licencing	During clearing works for each stage	Cease site works and refer to KPI and timing of activities
Develop a Wildlife Management Plan (WMP) addressing management actions of habitat removal	Project Ecologist	Approved WMP prior to construction of each stage	Prior to commencement of works for each stage	Amend where necessary
Indirect Impacts				
Retained Vegetation				
Establish Tree Protection Zones (TPZ) around retained habitat trees on the boundary	Contractor in consultation	TPZ is to 12xDBH in accordance with	Prior to commencement	Cease site works and refer to KPI

Mitigation Measures	Responsibility	KPI	Timing	Corrective Action
of the development/ within APZ area	with project ecologist	Australian Standards AS4970-2009. No go zone signs Fencing to include high vis bunting and star pickets.	of works for each stage	
Weeds, disease and edge effects				
Develop a weed management protocol to be included in Construction Environment Management Plan (CEMP) for constructions period to limit degradation of interface of development and retained vegetation	Contractor with Ecologist input	Approved CEMP (Inc. weed management protocols) prior to construction of each stage	Prior to commencement of works for each stage	Increases in weed presences, will require amendments to weed management protocols
Develop a Vegetation Management Plan (VMP) addressing ongoing impacts to retained and surrounding native vegetation.	Project Ecologist	Approved VMP prior to construction of each stage	Prior to commencement of works for each stage	Increases in weed presences, will require amendments to weed management protocols
Equipment and vehicles entering Site are cleaned of foreign soil and seed prior to entering the site	Contractors	Best practice hygiene protocols followed, No visible foreign material, certification available upon request	Prior to machinery arriving on Site	Non-compliance due to foreign material present, Refer to KPI
Noise and light Impacts				
Limit construction works to daylight hours to reduce impacts from light and noise	Construction contractor	No construction works to occur from dusk till dawn.	During construction works	Cease site works and refer to KPI
All machinery is correctly maintained and operator as per operation manual	Construction contractor	No excessive noise of machinery due to poor maintenance or faulty parts	During construction works and During Operation	Cease site works and refer to KPI
Dust Impacts				
Vehicles/machinery to observe 5-10 km/h speed limit on Site	Contractors	No excessive dust	For the duration of Site works	Reassess KPI and control measures if excessive dust continues
Pest animal				
Develop a Pest animal protocol to control any increases in pest animal population that may impact retained vegetation	Pest Animal contractor	Protocol approved as part of CEMP approval	During construction and operation	
Prescribed Biodiversity Impacts				
Erosion and sediment controls enacted in accordance with construction environment management plan (CEMP) to limit impacts on retained vegetation and creeklines.	Construction Contractor	CEMP followed & modified as needed	Prior to commencement of works, for duration of Site works	Cease site works, Refer to KPI

Mitigation Measures	Responsibility	KPI	Timing	Corrective Action
Establish Speed limits during construction and operation of the proposed development particularly on exit ramps	Project Manager	Low speed limits set to minimise vehicle strikes	Prior to construction and during operation	

13 Offset Requirements for Unavoidable Impacts

A summary of offset liabilities for the proposed development with respect to native vegetation are provided below:

An offset is required for all impacts of development on PCTs that are associated with:

- a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or
- a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or
- a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

13.1 Ecosystem Credits

Table 16 Ecosystem Credits

Vegetation Zone	PCT ID	Area (ha)	Vegetation Integrity Score (V.I) loss	Ecosystem Credits Required
VZ1_1589_Moderate	1589	0.58	81.9	24
VZ2_1589_Moderate (*A. costata*)	1589	0.21	64.4	7
VZ3_1589_Low	1589	0.40	72.9	15
VZ4_1590_Moderate	1590	8.21	81.9	336
VZ5_1590_Low	1590	0.37	75.3	14
VZ6_1590_Low (*M. nodosa*)	1590	1.73	50.7	44
VZ7_1619_Low	1619	0.94	56.4	20
			Total	**460**

13.2 Species Credits

Table 17 Species Credits

Species	Vegetation Zone	Habitat condition (HC)	Area (ha)/individual (HL)	Change in habitat condition	Biodiversity Risk Weighting	Candidate SAII	Species Credits Required
Myotis macropus (Southern Myotis)	VZ1_1589_Moderate	81.9	0.57	81.9	2	False	23
	VZ3_1589_Low	72.9	0.22	72.9	2	False	8
	VZ4_1590_Moderate	81.9	0.44	81.9	2	False	18
	VZ5_1590_Low	75.3	0.04	75.3	2	False	2
						Subtotal	
Petaurus norfolcensis (Squirrel Glider)	VZ1_1589_Moderate	81.9	0.58	81.9	2	False	24
	VZ2_1589_Moderate (*A. costata*)	64.4	0.21	64.4	2	False	7
	VZ3_1589_Low	72.9	0.40	72.9	2	False	15
	VZ4_1590_Moderate	81.9	8.21	81.9	2	False	336
	VZ5_1590_Low	74.8	0.37	74.8	2	False	14
	VZ6_1590_Low (*M. nodosa*)	50.7	1.73	50.7	2	False	44
	VZ7_1619_Low	56.4	0.94	56.4	2	False	26
						Subtotal	**466**

13.3 Areas not requiring Offsets

There is 0.65 ha of non-vegetated/cleared/road verge/exotic groundcover that will be impacted by the proposal. As this vegetation does not align with native vegetation, they do not require offsetting or further assessment.

13.4 Credit Summary

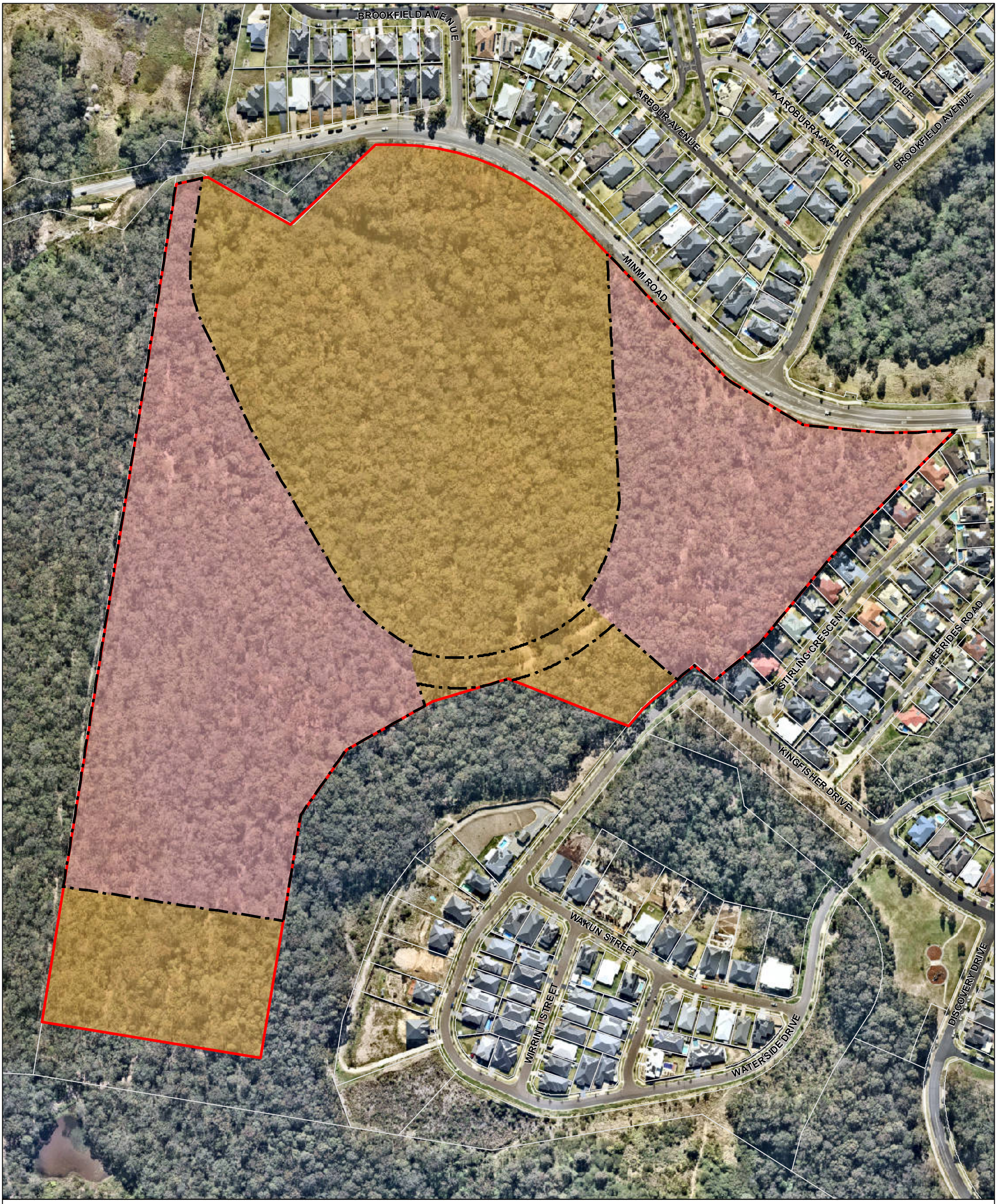
The following **Table 17** displays the required Biodiversity Offset Liability based on the BAM-C, BAM Credit Calculator and **Figure 12** depicts offset requirements.

Table 18 Biodiversity Liability Credit Summary

Ecosystem Credits	Offset Credits required
PCT 1589: Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast	46

Ecosystem Credits	Offset Credits required
PCT 1590: Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest	394
PCT 1619: Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands	20
Species Credits	
Myotis macropus (Southern Myotis)	51
Petaurus norfolcensis (Squirrel Glider)	466

The current method to retire credits for the proposal is likely to be via payment into the Biodiversity Conservation Fund. Credit retirement will be staged to reflect the likely future staged development of site areas for a school in the west and commercial in the east of the subject land.



505 MINMI RD, FLETCHER

FIGURE 11: PROPOSED ZONING

0 45 90 180

Meters

1:2,800

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries

Proposed Zoning

- C2: Environmental Conservation
- R2: Low Density Residential

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

505 MINMI RD, FLETCHER

FIGURE 12: OFFSET REQUIREMENTS

Legend

- Subject Land
- Impact Boundary
- Cadastral Boundaries
- Hollow Bearing Tree
- Impacts Requiring Offsets
- Areas Not to be Impacted
- Impacts Not Requiring Offsets

0 45 90 180

Meters

1:2,800

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 25/09/2023 | Version 2 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

14 Conclusion

MJD Environmental has been engaged by Barr Planning to prepare a Certification Assessment Report (BCAR) over the land of Lot 23 DP 1244350, 505 Minmi Rd, Fletcher, NSW. The preparation of the BCAR to address ecological matters as they pertain to the proposed rezoning of the Lot. The proposed rezoning (which will form a Planning Proposal) will comprise of a future residential area zoned as R2 Low Density Residential (12.70 ha) and the establishment of C2 Environmental Conservation land (13.54 ha). The entirety of the site is assessed herein for the purposes of the biocertification of the land.

The proposed rezoning covers approximately 26.23 ha which chiefly contains native vegetation across the site, with the exception of a number of access roads.

The subject land is not mapped on the *Biodiversity Values Map* (BVM); however, the proposal exceeds the area clearing threshold associated with the Minimum Lot Size (MLS) of the Lot. Therefore, the proposal triggers assessment under the Biodiversity Assessment Method (BAM) and entry into the Biodiversity Offset Scheme (BOS) as per Section 7.1.1 (b) of the BC Regulations (2017).

Application of the BAM was used to the establish biodiversity impacts of the proposal inclusive of impacts to native vegetation and threatened entities (species and communities) within the locality listed under the BC Act, requiring that an accredited assessor (AA) prepare and submit a BCAR to the approval consent authority. This is a non-strategic Biocertification requiring submission to the Minister within the Department of Planning and Environment, as per Part 8 of the BC Regulations (2017) in conjunction with the planning proposal. The BCAR requires a biodiversity certification strategy as per Section 12 of BAM 2020.

The proposed subject land is zoned as C4 Environmental Living and is currently a vacant bush lot containing unsealed roads, fences, rubbish and native vegetation. The land has undergone historic clearing and grazing evident by the young age cohorts of trees, fences, weed invasion and disturbed vegetation. The overall native woody vegetation is in moderate to poor condition comprising good species composition and structure, however substantial cover of the High Threat Exotic (HTE) species *Lantana camara* within the gullies.

A total of three Plant Community Types (PCTs) were identified within the subject land:

- 1589 – *Spotted Gum – Broad-leaved Mahogany – Grey Gum grass – shrub open forest on Coastal Lowlands of the Central Coast*
- 1590 – *Spotted Gum – Broad-leaved Mahogany – Red Ironbark shrubby open forest* commensurate with the BC Act listed Endangered Ecological Community (EEC) *Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions*
- 1619 – *Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia heathy open forest of coastal lowlands*

In addition, an assessment was undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Assessment concluded that no actions associated with the proposal are likely to have a significant impact on a Matter of National Significance.

Impact Avoidance & Mitigation

A package of avoidance and mitigation measures have been described in this BCAR associated with the project. The rezoning incorporates the establishment of two areas of C2 Environmental Conservation, including a large parcel within the core of the subject land, and the extension of C2 land with the south of the Lot. The proposed area of C2 zoning (13.54 ha) has increased by 10.43% from the preliminary 2020 submission of 10.8 ha. Site selection for the proposal aligns with future planning values of the Hunter Regional Plan 2041 and Greater Newcastle Metropolitan 2036. This includes the avoidance of important wildlife corridors within the region. As such, the proposed rezoning has been endorsed by the Hunter Central Coast Regional Planning Panel, deem to have both strategic and stie

specific merit. All measures have been incorporated into the design (avoidance) in the first instance with mitigation measures assessed for the construction phases of the project.

Impact Analysis

The proposal will result in the following impacts and required offsets as calculated using the BAM-C Calculator:

Ecosystem Credits

- 1.20 ha of PCT 1589 requiring 46 ecosystem credits
- 10.31 ha of PCT 1590 (TEC) requiring 394 ecosystem credits
- 0.94 ha of PCT 1619 requiring 20 ecosystem credits

Species Credits

- *Myotis macropus* (Southern Myotis) requiring 51 credits
- *Petaurus norfolcensis* (Squirrel Glider) requiring 466 credits

There is no requirement to offset:

- 0.65 ha of exotic vegetation and non-vegetated areas (access tracks)

Biodiversity Certification Strategy

As per section 12 BAM 2020, the BCAR strategies outlines the conservation measures proposed to offset impacts to the proposed biocertification. As the BCAR is non-strategic, items 1 – 3 do not relate to this proposal. No Biodiversity credits will be created as a component of this proposal and therefore the credit value of conservation measures applied not assessed.

The current method to retire credits for the proposal is likely to be via payment into the Biodiversity Conservation Fund or retirement of credits available on the market.

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Appendix A Draft Development Design

DRAFT SITE PLAN - OPTION 1
Scale 1:2000 @ A1

0 30 60 90 120m

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NA

ENGINEER:
NA

CLIENT:
Barr Property

No: DATE: REVISION: BY:

NOTE: DRAWING PURPOSES FOR APPROVAL ONLY. NOT FOR CONSTRUCTION.

PROJECT:
Development
No. 1 Project Street

Status: DRAFT

North

DRAFT SITE PLAN - OPTION 1

SCALE: 1:2000
ORIGINAL DRAWING AT A1.
Drawn By: MED
Checked By: DM Approved By: DM

Project No. 0000
Drawing No. LP08
Rev

Appendix B BAM Plot Data

Plot Info							Composition						Structure (%)						Function									
Plot	PCT	Condition Class	Zone	Easting	Northing	Bearing	Tree	Shrub	Grass	Forbs	Ferns	Other	Tree	Shrub	Grass	Forbs	Ferns	Other	Lge Tree	Hollows	Litter Cover (%)	Logs	Tree Stem 5-10	Tree Stem 10-20	Tree Stem 20-30	Tree Stem 30-50	Tree Stem 50-80	Tree Regen	HTE (%)
B01	1590	1590_Moderate	56	372101	6361454	25	5	6	9	6	0	6	62.3	4.1	65.2	1.1	0.0	0.8	1	0	82.0	0.0	Y	Y	Y	Y	Y	Absent	1.5
B02	1589	1589_Moderate_A_costata	56	371648	6361079	5	8	6	10	4	0	7	67.1	9.7	98.1	0.8	0	1.7	3	3	66	15	Y	Y	Y	Y	Y	Present	2.5
B03	1619	1619_Low	56	371732	6361248	190	4	11	8	5	0	6	60.1	24.3	64.4	0.6	0	0.9	2	0	90	5	Y	Y	Y	Y	Y	Present	1.0
B04	1590	1590_Moderate	56	372118	6361532	243	6	4	11	9	0	4	60.1	2.6	45.0	1.0	0.0	0.4	3	0	55.0	6.0	Y	Y	Y	Y	Y	Present	2.0
B05	1590	1590_Low_M_nodosa	56	371604	6361278	349	6	7	9	4	0	2	38.2	71.9	28.1	0.4	0	0.2	3	0	66	15	Y	Y	Y	Y	Y	Present	0.1
B06	1589	1589_Moderate	56	371734	6361626	100	7	8	14	6	0	6	67.5	2.8	73.8	1.0	0.0	0.6	4	0	89.0	21.0	Y	Y	Y	Y	Y	Present	10.0
B07	1589	1589_Low	56	371649	6361681.0	85	9	10	11	10	1	10	58.2	3.3	16.1	1.2	0.1	1.8	4	0	72.0	9.0	Y	Y	Y	Y	Y	Absent	85.1
B08	1590	1590_Moderate	56	371553	6361092	85	85	9	10	12	1	0	1	51.7	3.7	92.5	0.1	0.0	1	0	56.0	30.0	Y	Y	Y	Y	Y	Present	1.0
B09	1589	1589_Moderate	56	371807	6361738	95	6	6	13	9	0	11	65.3	4.5	49.2	1.4	0.0	1.6	6	3	85.0	32.0	Y	Y	Y	Y	Y	Absent	7.2
B10	1589	1589_Low	56	371754	6361471.0	143	9	8	9	6	1	12	69.4	3.9	54.1	0.7	0.1	1.7	6	1	70.0	18.0	Y	Y	Y	Y	Y	Absent	70.0
B11	1590	1590_Low	56	371944	6361460.0	245	8	6	10	3	1	7	81.0	6.1	80.8	5.0	0.5	3.1	2	3	71.0	14.0	Y	Y	Y	Y	Y	Present	50.0
B12	1590	1590_Moderate	56	371621	6361133.0	15	5	10	9	2	0	5	73.0	86.9	76.8	0.6	0.0	1.7	3	3	95.0	32.0	Y	Y	Y	Y	Y	Present	0.0

Appendix C Flora and Fauna Species Tables

Flora List

Family	Scientific Name	Common Name	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12
Acanthaceae	*Brunoniella australis*	Blue Trumpet	X			X		X	X		X	X		
	Brunoniella pumilio	Dwarf Blue Trumpet	X	X	X	X	X	X	X		X	X		
	Pseuderanthemum variabile	Pastel Flower							X					
Amaranthaceae	**Alternanthera philoxeroides*	Alligator Weed												
Apocynaceae	*Parsonsia straminea*	Monkey Rope							X					
Araceae	*Gymnostachys anceps*	Settlers' Twine							X					
Araliaceae	*Polyscias sambucifolia* subsp. *sambucifolia*	Elderberry Panax						X	X			X		X
Asparagoides	**Asparagus aethiopicus*	Ground Asparagus		X			X		X		X			
Asteraceae	*Cyanthillium cinereum* var. *cinereum*				X	X		X	X					
	Ozothamnus diosmifolius	Rice Flower												X
Bignoniaceae	*Pandorea pandorana* subsp. *pandorana*	Wonga Wonga Vine	X		X				X	X	X	X	X	
Celastraceae	*Denhamia silvestris*	Narrow-leaved Orangebark							X					
Chenopodiaceae	*Einadia hastata*	Berry Saltbush							X					
Commelinaceae	*Commelina cyanea*	Commelina							X					
Convolvulaceae	*Convolvulus* spp.			X		X					X		X	
	Dichondra repens	Kidney Weed				X	X	X	X		X		X	
Cyperaceae	*Carex appressa*	Tall Sedge										X		
	Carex spp.							X						
	Cyperus gracilis	Slender Flat-sedge							X					
	Gahnia clarkei	Tall Saw-sedge										X		

Family	Scientific Name	Common Name	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12
	Lepidosperma laterale		X	X		X	X	X		X				
	Ptilothrix deusta				X									
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower			X		X							
	Hibbertia empetrifolia				X		X							
	Hibbertia scandens	Climbing Guinea Flower	X		X						X		X	X
Dioscoreaceae	*Dioscorea transversa*	Native Yam									X	X		
Ericaceae (Epacridoideae)	*Leucopogon juniperinus*	Prickly Beard-heath								X				
Fabaceae (Caesalpinioideae)	*Senna pendula* var. *glabrata**	Senna									X			
Fabaceae (Faboideae)	*Daviesia squarrosa*			X						X				X
	Daviesia ulicifolia	Gorse Bitter Pea			X	X	X	X	X		X		X	X
	Desmodium varians	Slender Tick tre-foil							X		X	X		
	Glycine clandestina	Glycine	X	X	X	X	X		X			X	X	X
	Glycine tabacina											X		
	Glycine microphylla	Small-leaf Glycine												X
	Hardenbergia violacea	False Sarsaparilla	X	X				X			X			X
	Kennedia prostrata	Running Postman	X	X	X	X		X			X	X	X	
	Mirbelia speciosa subsp. *speciosa*	Purple Mirbelia												
	Podolobium ilicifolium	Prickly Shaggy Pea												
	Pultenaea euchila	Orange Pultenaea	X	X	X					X			X	X
	Pultenaea spinosa	Spiny Bush-pea		X				X						X
	Pultenaea villosa	Hairy Bush-pea			X									
Fabaceae (Mimosideae)	*Acacia falcata*	Hickory Wattle		X	X			X		X	X	X		
	Acacia fimbriata	Fringed Wattle								X				
	Acacia ulicifolia	Prickly Moses	X	X	X	X	X	X		X		X	X	X

Family	Scientific Name	Common Name	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12
Goodeniaceae	*Goodenia heterophylla subsp. heterophylla*				X	X					X			
Haloragaceae	*Gonocarpus tetragynus*											X		
Lamiaceae	*Clerodendrum tomentosum*	Hairy Clerodendrum							X		X	X		
Lauraceae	*Cassytha glabella* var. *glabella*	Devils Twine		X				X	X					
Lobeliaceae	*Lobelia purpurascens*	Whiteroot					X				X	X	X	X
Lomandraceae	*Lomandra confertifolia*	Mat-rush	X	X					X	X	X			X
	Lomandra filiformis subsp. *coriacea*							X	X		X	X		
	Lomandra filiformis subsp. *filiformis*	Wattle Mat-rush	X	X	X			X	X	X	X			
	Lomandra longifolia	Spiny-headed Mat Rush			X	X					X	X	X	
	Lomandra multiflora subsp. *multiflora*	Many-flowered Mat Rush	X	X	X	X	X	X		X	X		X	X
	Lomandra obliqua			X	X		X			X				X
Loranthaceae	*Muellerina eucalyptoides*			X	X									
Luzuriagaceae	*Eustrephus latifolius*	Wombat Berry	X	X				X	X		X	X		
	Geitonoplesium cymosum	Scrambling Lily				X		X	X			X		
Malvaceae	*Brachychiton populneus* subsp. *populneus*	Kurrajong							X					
Menispermaceae	*Stephania japonica* var. *discolor*	Snake Vine							X			X		
Myrtaceae	*Angophora costata*	Smooth-barked Apple		X	X								X	
	Callistemon linearis	Narrow-leaved Bottlebrush						X						
	Corymbia gummifera	Red Bloodwood		X	X									
	Corymbia maculata	Spotted Gum	X	X		X	X	X	X	X	X	X	X	X
	Eucalyptus acmenoides	White Mahogany	X	X		X	X	X	X	X	X	X	X	
	Eucalyptus fibrosa	Red Ironbark	X	X		X	X	X	X	X			X	X
	Eucalyptus globoidea	White Stringybark		X						X				X
	Eucalyptus paniculata	Grey Ironbark						X	X		X	X	X	

Family	Scientific Name	Common Name	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12
	Eucalyptus punctata	Grey Gum				X		X	X	X	X	X	X	X
	Eucalyptus siderophloia	Grey Ironbark										X		
	Eucalyptus umbra	Broad-leaved White Mahogany	X	X	X	X	X	X	X	X		X	X	X
	Leptospermum polygalifolium subsp. *polygalifolium*	Tantoon			X					X				
	Melaleuca nodosa	Prickly-leaved Paperbark					X					X		X
	Melaleuca styphelioides	Prickly-leaved Tea-tree										X		
Oleaceae	*Notelaea longifolia f. longifolia*	Large Mock-olive	X	X	X	X	X	X	X	X	X	X	X	
	Notelaea ovata								X					
Oxalidaceae	*Oxalis perrenans*			X										
Phormaceae	*Dianella caerulea* var. *producta*	Blue Flax-lily	X	X	X	X	X	X		X	X	X		
	Dianella longifolia	Blueberry Lily	X											
	Dianella revoluta var. revoluta		X	X	X	X		X			X		X	
Phyllanthaceae	*Breynia oblongifolia*	Coffee bush	X			X		X	X		X	X	X	
	Glochidion ferdinandi var. *ferdinandi*	Cheese Tree					X			X		X		
	Phyllanthus hirtellus	Thyme Spurge	X		X		X			X				X
Pittosporaceae	*Billardiera scandens* var. *scandens*	Apple Berry dumpling			X		X	X	X				X	X
	Bursaria spinosa	Blackthorn	X	X	X	X	X		X	X	X	X	X	X
	Pittosporum multiflorum	Orangethorn							X					
	Pittosporum revolutum	Wild Yellow Jasmine	X						X		X			
	Pittosporum undulatum	Sweet Daphne												
Plantaginaceae	**Plantago lanceolata**	Lamb's Tongue									X			
	Veronica plebeia	Trailing Speedwell									X	X		
Poaceae	*Aristida ramosa*	Purple Wiregrass	X											X

Family	Scientific Name	Common Name	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12
	Aristida vagans	Threeawn Speargrass	X	X	X	X		X	X	X	X		X	X
	Cymbopogon refractus	Barbed-wire Grass						X						
	Dichelachne micrantha	Shorthair Plumegrass				X					X			
	Echinopogon caespitosus var. *caespitosus*	Hedgehog- grass						X					X	
	Entolasia marginata	Bordered Panic						X						
	Entolasia stricta	Wiry Panic	X	X	X	X	X	X	X	X	X	X	X	X
	Eragrostis brownii	Brown's Lovegrass					X							
	Imperata cylindrica	Blady Grass				X		X	X		X	X	X	
	Microlaena stipoides var. *stipoides*	Weeping Grass		X			X		X	X		X		
	Oplismenus aemulus	Australian Basket Grass							X		X		X	X
	Oplismenus imbecillis	Basket Grass							X			X		
	Panicum simile	Two-colour Panic								X			X	X
	Paspalidium distans													X
	Poa affinis					X	X	X		X	X			
	Poa sieberi	Snowgrass											X	X
	Rytidosperma bipartitum	Wallaby Grass				X	X	X			X			
	Rytidosperma pallidum	Silvertop Wallaby Grass	X	X	X	X		X		X	X			
	Themeda triandra	Kangaroo Grass	X	X	X	X	X	X		X	X	X	X	X
Primulaceae	*Myrsine variabilis*								X		X			
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung			X					X				
Pteridaceae	*Adiantum aethiopicum*	Common Maidenhair										X		
	Cheilanthes sieberi subsp. sieberi	Poison Rock Fern							X				X	X
Ranunculaceae	*Clematis aristata*	Old Man'Beard			X				X		X	X		
	Clematis glycinoides var. *glycinoides*	Headache Vine									X		X	X

Family	Scientific Name	Common Name	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11	B12
Rhamnaceae	*Alphitonia excelsa*	Red Ash								X				
Rosaceae	*Rubus parvifolius*	Native Raspberry										X		
Rubiaceae	*Gynochthodes jasminoides*	Sweet Morinda												
	Opercularia diphylla				X	X								
Rutaceae	*Boronia polygalifolia*	Dwarf Boronia	X			X								X
Smillaceae	*Smilax australis*	Wait-a-while									X			
Solanacea	*Solanum prinophyllum*	Forest Nightshade							X					
	Solanum stelligerum	Devil's Needles							X					
Thymelaeceae	*Pimelea linifolia*	Slender Rice Flower												
Typhaceae	*Typha orientalis*	Broadleaf Cumbungi												
Verbenaceae	**Lantana camara**	Lantana		X	X			X	X		X	X	X	X
Vitaceae	*Cayratia clematidea*	Native Grape							X			X		
	Cissus antarctica	Kangaroo Vine										X		
Violaceae	*Viola hederacea*	Ivy-leaved Violet									X			
Xanthorrhoeaceae	*Xanthorrhoea* spp.													

*Non-native
(V) = Vulnerable under the BC And EPBC Acts

Fauna List

Common Name	Scientific Name
Mammals	
Brushtail Possum	*Trichosurus vulpecula*
Brown Antechinus	*Antechinus stuartii*
Bush Rat	*Rattus fuscipes*
Feathertail Glider	*Acrobates pygmaeus*
**Red Fox	*Vulpes vulpes*
Red-necked Wallaby	*Macropus rufogriseus*
Sugar Glider	*Petaurus breviceps*
Squirrel Glider	***Petaurus norfolcensis (V)***
Short-beaked Echidna	*Tachyglossus aculeatus*
Grey-headed Flying Fox	***Pteropus poliocephalus (V)***
Chocolate Wattled Bat	*Chalinolobus morio*
Eastern Broad-nosed Bat	*Scotorepens orion*
***Eastern Cave Bat**	***Vespadelus troughtoni (V)***
Eastern Coastal Free-tailed Bat	***Micronomus norfolkensis (V)***
Eastern Horseshoe Bat	*Rhinolophus megaphyllus*
***Eastern False Pipistrelle**	***Falsistrellus tasmaniensis (V)***
Eastern Forest Bat	*Vespadelus pumilus*
Gould's Wattled Bat	*Chalinolobus gouldii*
***Greater Broad-nosed Bat**	***Scoteanax rueppellii (V)***
Large Forest Bat	*Vespadelus darlingtoni*
Little Bentwing Bat	***Miniopterus australis (V)***
*Little Forest Bat	*Vespadelus vulturnus*
#Long-eared Pied Bat	***Chalinolobus dwyeri (V)***
Ride's Freetail Bat	*Mormopterus ridei*
*Southern Free-tailed Bat	*Mormopterus planiceps*
***Southern Myotis**	***Myotis macropus (V)***
***Yellow-bellied Sheath-tailed Bat**	***Saccolaimus flaviventris (V)***
White-striped Free-tailed Bat	*Austronomus australis*
Birds	
Australian Magpie	*Cracticus tibicen*
Australian Owlet Nightjar	*Aegotheles cristatus*
Australian Raven	*Corvus coronoides*
Bell Miner	*Manorina melanophrys*
Black-faced Cuckoo-Shrike	*Coracina novaehollandiae*
Brown Goshawk	*Accipiter fasciatus*
Brown Thornbill	*Acanthiza pusilla*
Eastern Rosella	*Platycercus eximius*
Eastern Whipbird	*Psophodes olivaceus*
Eastern Yellow Robin	*Eopsaltria australis*
Grey Butcherbird	*Cracticus torquatus*
Grey Fantail	*Rhipidura fuliginosa*

Common Name	Scientific Name
Laughing Kookaburra	*Dacelo novaeguineae*
Lewin's Honeyeater	*Meliphaga lewinii*
Noisy Friarbird	*Philemon corniculatus*
Noisy Miner	*Manorina melanocephala*
Olive-backed Oriole	*Oriolus sagittatus*
Pied Currawong	*Strepera graculina*
Rainbow Lorikeet	*Trichoglossus haematodus*
Red Wattle Bird	*Anthochaera carunculata*
Sacred Kingfisher	*Todiramphus sanctus*
Southern Boobook	*Ninox novaeseelandiae*
Spotted Pardalote	*Pardalotus punctatus*
Sulphur-crested Cockatoo	*Cacatua galerita*
Superb Fairy-wren	*Malurus cyaneus*
White-browed Scrubwren	*Sericornis frontalis*
White-winged Chough	*Corcorax melanorhamphos*
Yellow-faced Honeyeater	*Lichenostomus chrysops*
Herpetofauna	
Delicate Skink	*Lampropholis delicata*
Blue Tongue Lizard	*Tiliqua scinoides scinoides*
Red-bellied Black Snake	*Pseudechis porphyriacus*
Lace Monitor	*Varanus varius*
Dusky Toadlet	*Uperoleia fusca*
Common Eastern Froglet	*Crinia signifera*
Spotted Marsh Frog	*Limnodynastes tasmaniensis*
Striped Marsh Frog	*Limnodynastes peronii*

**Introduced, *Probable, #Possible

(V) = Vulnerable under the BC And EPBC Acts

Appendix D Habitat Tree Data

Impacted				
ID	**Classification**	**Number of Hollows**	**Hollow Size (cm)**	**Hollow Height (m)**
1	Hollow-bearing Tree	2	5|5	7|7
2	Hollow-bearing Tree	1	8	6
3	Terrarium			5
4	Hollow-bearing Tree	3	5|5|5	8|9|9
5	Hollow-bearing Tree			8
6	Hollow-bearing Tree	3	10|5|5	7|7|7
7	Hollow-bearing Tree	1	5	3
8	Hollow-bearing Stag	2	15|10	6|5
9	Hollow-bearing Tree	2	5|5	8|8
10	Stag			
11	Hollow-bearing Tree			8
12	Hollow-bearing Tree	1	5	5
23	Hollow-bearing Tree	1	5	10
24	Hollow-bearing Tree	2	20|20	9|9
26	Hollow-bearing Tree	1	5	7
37	Hollow-bearing Tree	2	5|5	7|7
39	Hollow-bearing Stag	1	20	5
40	Hollow-bearing Tree	1	8	7
43	Hollow-bearing Tree	1	5	8
44	Hollow-bearing Tree	1	5	4
45	Hollow-bearing Tree	4	30|30|5|5	8|10|8|8
46	Hollow-bearing Stag	2	30|8	12|8
Retained				
ID	**Classification**	**Number of Hollows**	**Hollow Size (cm)**	**Hollow Height (m)**
13	Hollow-bearing Tree			9
14	Hollow-bearing Tree	1	5	6
16	Hollow-bearing Tree	3	5|5|5	10|12|13
17	Hollow-bearing Stag	1	5	7
18	Hollow-bearing Stag	2	20|30	
20	Stag			
21	Hollow-bearing Tree			7
22	Stag			
27	Hollow-bearing Tree	1	15	8
28	Hollow-bearing Tree			10
29	Hollow-bearing Tree			10
30	Hollow-bearing Tree			10|12
31	Hollow-bearing Tree	2	30|30	9|11
32	Hollow-bearing Tree	1	5	8

34	Hollow-bearing Tree			8
36	Hollow-bearing Tree	1	5	8
38	Hollow-bearing Tree	1	10	9
41	Hollow-bearing Stag	2	8|8	5|7
47	Hollow-bearing Tree	2	8|8	8|10
48	Hollow-bearing Stag	4	12|8|8|5	7|8|9|8

Appendix E Koala SAT Survey

SAT #1		
Tree Species	**GPS Coordinates**	**Scat Present**
E. fibrosa	(151.62857566666400544 -32.87532683333250105 0)	No
E. fibrosa	(151.62857523296699469 -32.87530716696910105 0)	No
E. fibrosa	(151.62858016666399408 -32.87530483333249975 0)	No
E. acmenoides	(151.62846116423401099 -32.87535960973160343 0)	No
E. acmenoides	(151.62865496593099124 -32.87531029777890268 0)	No
E. acmenoides	(151.62850266666399079 -32.87536833333250286 0)	No
C. maculata	(151.62855283333101397 -32.87537783333250019 0)	No
C. maculata	(151.62857983333100265 -32.87535399999919861 0)	No
C. maculata	(151.62859499999700574 -32.87532016666590096 0)	No
C. maculata	(151.62858633333098624 -32.87531283333250087 0)	No
C. maculata	(151.62859299999701079 -32.87531766666590016 0)	No
E. fibrosa	(151.62855724781900335 -32.87544218285589892 0)	No
E. punctata	(151.62837722403401131 -32.87543816332190261 0)	No
E. acmenoides	(151.62840591911799493 -32.87540645400890327 0)	No
E. fibrosa	(151.62846633333100499 -32.87550316666590078 0)	No
C. maculata	(151.62852749999700563 -32.87538116666590327 0)	No
E. fibrosa	(151.62851442626399034 -32.87540292949260134 0)	No
C. maculata	(151.62867215682499022 -32.87531748879229809 0)	No
E fibrosa	(151.62870122161200 47 -32.87532542050669804 0)	No
E fibrosa	(151.62871426039498601 -32.87534618839040235 0)	No
E fibrosa	(151.62870943298599968 -32.87538198883289908 0)	No
E. acmenoides	(151.62863040568498718 -32.87544557551679958 0)	No
C. maculata	(151.62860820025500175 -32.87544943801810149 0)	No
E. fibrosa	(151.62839047822001248 -32.8755059052300993 0)	No
E. acmenoides	(151.62848167305699576 -32.87551704494430282 0)	No
C. maculata	(151.62847299999700112 -32.87546233333250001 0)	No
C. maculata	(151.62850849999699676 -32.87547783333250351 0)	No
E. fibrosa	(151.62849638238600392 -32.87549051226299923 0)	No
C. maculata	(151.62844233333100874 -32.87550616666590031 0)	No
E. fibrosa	(151.62842283333100113 -32.87549599999920247 0)	No
SAT #2		
Tree Species	**GPS Coordinates**	**Scat Present**
C. maculata	(151.6302133333309996 -32.87538583333250131 0)	No
C. maculata	(151.63019799999699444 -32.87533249999920315 0)	No
C. maculata	(151.63018516666400615 -32.87531883333249993 0)	No
E. fibrosa	(151.63017299999700072 -32.87530349999919821 0)	No
E. fibrosa	(151.63017316666400802 -32.8752961666658976 0)	No
C. maculata	(151.63012799999700064 -32.87531749999919839 0)	No
E. punctata	(151.63011766666400604 -32.87534383333250076 0)	No
C. maculata	(151.63014449999698741 -32.87550633333250261 0)	No
E. acmenoides	(151.63023566666399233 -32.87541199999920138 0)	No

C. maculata	(151.6302043333309939 -32.8753946666658976 0)	No
E. acmenoides	(151.63021516666398725 -32.87539916666590045 0)	No
C. maculata	(151.63020299999701024 -32.87540849999920312 0)	No
E. punctata	(151.62995983333098593 -32.87531883333249993 0)	No
E. acmenoides	(151.63000199999700612 -32.87536849999919752 0)	No
E. acmenoides	(151.62999533333100999 -32.87544416666590053 0)	No
C. maculata	(151.62999499999699538 -32.87544033333249871 0)	No
E. punctata	(151.63005483333100187 -32.87549166666590139 0)	No
E. acmenoides	(151.63008983333099877 -32.8753118333325034 0)	No
C. maculata	(151.63021033333100718 -32.87527683333249939 0)	No
C. maculata	(151.63020099999698687 -32.87526166666589944 0)	No
C. maculata	(151.63009599999699617 -32.87526299999920099 0)	No
E. fibrosa	(151.63004826633201105 -32.87528671649999978 0)	No
C. maculata	(151.62998941350400628 -32.875309345286297 0)	No
C. maculata	(151.63006474535998791 -32.87537714961020185 0)	No
E. acmenoides	(151.63007666666399587 -32.87548499999920182 0)	No
E. fibrosa	(151.6300199999969891 -32.87534349999919669 0)	No
E. acmenoides	(151.62999516666400268 -32.87534983333249983 0)	No
E. acmenoides	(151.62999344300300208 -32.87535002792299821 0)	No
E. acmenoides	(151.62998661580098769 -32.87535999999919767 0)	No
E. umbra	(151.63005849999700558 -32.87541433333250041 0)	No
SAT #3		
Tree Species	**GPS Coordinates**	**Scat Present**
E. acmenoides	(151.62863904522600933 -32.87655614913919777 0)	No
E. acmenoides	(151.62866229384201233 -32.87662206551009803 0)	No
E. acmenoides	(151.62866425333700704 -32.87662597531630126 0)	No
C. maculata	(151.62867522418400767 -32.87663721478460133 0)	No
C. maculata	(151.62857955886198624 -32.87670064555950233 0)	No
E. acmenoides	(151.62848153172600973 -32.87672951137280108 0)	No
E. punctata	(151.6285578862670036 -32.87667513189089874 0)	No
E. fibrosa	(151.6284649999969929 -32.87661066666589704 0)	No
E. fibrosa	(151.62843616666398816 -32.87661783333260246 0)	No
C. maculata	(151.62848657552800091 -32.87665352451769962 0)	No
C. maculata	(151.62851795649498854 -32.87664897418500232 0)	No
C. maculata	(151.62852460320200976 -32.87663607840369906 0)	No
E. acmenoides	(151.62875816666399942 -32.8766738333324966 0)	No
E. punctata	(151.6287614999970117 -32.87663433333249685 0)	No
C. maculata	(151.62843214978801143 -32.8766517827040019 0)	No
E. fibrosa	(151.62843697219099681 -32.8767028645021 0)	No
E. umbra	(151.62852166666399967 -32.87652199999919844 0)	No
E. fibrosa	(151.62855817254700241 -32.87670774593360079 0)	No
E. acmenoides	(151.62857652104401041 -32.87673240339019998 0)	No
C. maculata	(151.62857692996200853 -32.87676885835239915 0)	No
C. maculata	(151.62862431762201254 -32.8767620260450002 0)	No
C. maculata	(151.62865931393099572 -32.87668984385830129 0)	No

E. acmenoides	(151.62866590318000704 -32.87677376884489888 0)	No
E. fibrosa	(151.6284236666639913 -32.8765818333325015 0)	No
C. maculata	(151.62846239376199264 -32.87668748767279681 0)	No
E. acmenoides	(151.6285118333310038 -32.87652983333249779 0)	No
E. umbra	(151.62855168221099689 -32.87663635788010197 0)	No
E. umbra	(151.62848166666398697 -32.87647966666590094 0)	No
E. umbra	(151.62843166666399952 -32.87652633333249952 0)	No
C. maculata	(151.62842016666400013 -32.8765369999992032 0)	No
SAT #4		
Tree Species	**GPS Coordinates**	**Scat Present**
E. fibrosa	(151.6303222540030049 -32.8767605394239979 0)	No
E. fibrosa	(151.63034095461199513 -32.87666242439340181 0)	No
E. punctata	(151.62999294911901416 -32.87652879642639903 0)	No
E. umbra	(151.63004566631698822 -32.87656162946090177 0)	No
E. acmenoides	(151.63005388747200186 -32.87652425761390163 0)	No
E. acmenoides	(151.63008267659000694 -32.87664568900510176 0)	No
E. acmenoides	(151.63012560278301066 -32.87670684636260177 0)	No
E. punctata	(151.62998090622400582 -32.87676514895829882 0)	No
E. punctata	(151.63005299837598727 -32.87680108758370068 0)	No
E. acmenoides	(151.6300869962109914 -32.8767781888475028 0)	No
E. umbra	(151.63006187535501113 -32.87682055304509987 0)	No
E. acmenoides	(151.63021192420001171 -32.8768038603038022 0)	No
E. punctata	(151.63023499455499632 -32.87650381831549851 0)	No
E. fibrosa	(151.63020802527600495 -32.87643486972230278 0)	No
E. acmenoides	(151.63007051417901039 -32.87637583008849873 0)	No
E. umbra	(151.63028518630301278 -32.8766424656970031 0)	No
C. maculata	(151.63034115882999231 -32.87671025744929665 0)	No
E. acmenoides	(151.63011791273399353 -32.87665222631240169 0)	No
E. fibrosa	(151.63012983364998831 -32.87655819076390173 0)	No
E. acmenoides	(151.62992584436798893 -32.87655812439209768 0)	No
E. acmenoides	(151.6299109999970085 -32.87657366666589809 0)	No
E. fibrosa	(151.63030818284499901 -32.87656670265189973 0)	No
E. punctata	(151.6302547929049922 -32.87654047161679927 0)	No
E. acmenoides	(151.62990644733301338 -32.87671347826690038 0)	No
E. fibrosa	(151.63003171654401058 -32.87667541456949749 0)	No
E. punctata	(151.63015491533099066 -32.87663785732640065 0)	No
E. fibrosa	(151.63021467983799084 -32.87671967905689741 0)	No
E. acmenoides	(151.62997216666400391 -32.8766126666658991 0)	No
E. acmenoides	(151.62995566666398872 -32.87661349999920191 0)	No
E. fibrosa	(151.62994166666399565 -32.87665699999919866 0)	No
SAT #5		
Tree Species	**GPS Coordinates**	**Scat Present**
E. punctata	(151.63181366666398731 -32.87660349999919873 0)	No
E. acmenoides	(151.63173449999700892 -32.8766281666659026 0)	No
E. acmenoides	(151.63173516666398655 -32.87663059276459876 0)	No

E. acmenoides	(151.63174883333098819 -32.87664166666589693 0)	No
E. acmenoides	(151.63175816666401374 -32.87668083333250024 0)	No
E. acmenoides	(151.63182583333099274 -32.87668866666589906 0)	No
E. acmenoides	(151.63179849999698945 -32.8766769999991979 0)	No
E. acmenoides	(151.63189916666399881 -32.87666949999920263 0)	No
E. acmenoides	(151.63184783333099404 -32.8766704999992001 0)	No
E. punctata	(151.63187967005799806 -32.87662249660530023 0)	No
E. acmenoides	(151.6318894156690078 -32.87657577589489932 0)	No
E. acmenoides	(151.6318301887610005 -32.8766043443811995 0)	No
E. acmenoides	(151.63178150108399223 -32.87658720043400251 0)	No
E. fibrosa	(151.63195266666400585 -32.87671983333250125 0)	No
E. fibrosa	(151.63196399999699793 -32.87675549999919866 0)	No
E. fibrosa	(151.63195699999698718 -32.87675021729779701 0)	No
E. fibrosa	(151.63191083333100551 -32.87676666666590108 0)	No
E. punctata	(151.63181283333099714 -32.87671916666580074 0)	No
E. acmenoides	(151.63174383333100081 -32.87668733333249804 0)	No
E. acmenoides	(151.63177399999699446 -32.87669199999920266 0)	No
E. acmenoides	(151.63175466666399416 -32.87671166666579836 0)	No
E. punctata	(151.63179316666401064 -32.87671949999919718 0)	No
C. maculata	(151.63178033333099393 -32.8767398333325005 0)	No
E. acmenoides	(151.63192549999700987 -32.87666949999920263 0)	No
E. acmenoides	(151.63186633333100417 -32.87675799999919946 0)	No
C. maculata	(151.63181027275399515 -32.87673338179420313 0)	No
E. acmenoides	(151.63183949999699962 -32.87674216666589899 0)	No
E. punctata	(151.63186016666401201 -32.87673749999920148 0)	No
E. acmenoides	(151.63187633333100734 -32.87671183333250013 0)	No
E. acmenoides	(151.63192210949799232 -32.87670697262399955 0)	No
SAT #6		
Tree Species	**GPS Coordinates**	**Scat Present**
C. maculata	(151.62867833333100975 -32.87796866666590034 0)	No
E. umbra	(151.62867016666399422 -32.8779494999991968 0)	No
C. maculata	(151.62864083333099074 -32.87803649999919742 0)	No
C. maculata	(151.62859866666400421 -32.87801849999920023 0)	No
C. maculata	(151.62859583016700071 -32.87799584704590217 0)	No
C. maculata	(151.62862599999701274 -32.87798499999919954 0)	No
C. maculata	(151.62854582037999762 -32.87802430915400009 0)	No
C. maculata	(151.6285619999970038 -32.87803216666590345 0)	No
C. maculata	(151.62848999999698663 -32.87800901672520126 0)	No
E. fibrosa	(151.62855816666399278 -32.87797433333250297 0)	No
C. maculata	(151.62857805698700986 -32.87796360967629994 0)	No
C. maculata	(151.62861016113200208 -32.87795531120330139 0)	No
C. maculata	(151.62853149999699554 -32.87817383333249666 0)	No
C. maculata	(151.62855533333100766 -32.8781424999991998 0)	No
C. maculata	(151.62852816666401168 -32.87791816666589995 0)	No
C. maculata	(151.62856149999700506 -32.87790349999919925 0)	No

C. maculata	(151.62851489081899103 -32.87802628164269692 0)	No
C. maculata	(151.62863566615700961 -32.87805656636150076 0)	No
E. fibrosa	(151.6286581666639961 -32.8780496666659019 0)	No
E. umbra	(151.62867358405500795 -32.87808116811490322 0)	No
C. maculata	(151.62865566666400241 -32.87810283333249828 0)	No
C. maculata	(151.62860599999700639 -32.87808016666590305 0)	No
C. maculata	(151.62857325534099573 -32.87810962692069694 0)	No
C. maculata	(151.62844266666400017 -32.87796199999920077 0)	No
E. umbra	(151.62862875562498743 -32.87789105083400187 0)	No
C. maculata	(151.62853683333099752 -32.8780561666658997 0)	No
E. umbra	(151.62852099999699362 -32.87808616666590211 0)	No
C. maculata	(151.6285089999969955 -32.87809966666589645 0)	No
C. maculata	(151.628432666663997 -32.87810499999920211 0)	No
E. punctata	(151.62843247312198969 -32.87807619685810323 0)	No
SAT #7		
Tree Species	**GPS Coordinates**	**Scat Present**
E. fibrosa	(151.63022165473600467 -32.87817043745800305 0)	No
C. maculata	(151.63026715159901414 -32.87810639014350045 0)	No
E. umbra	(151.63027633333101107 -32.87812699999920341 0)	No
E. umbra	(151.63027616666400377 -32.8781083333324986 0)	No
E. umbra	(151.6302454999969882 -32.87806083333249774 0)	No
C. maculata	(151.6301241977180041 -32.87807323203019649 0)	No
E. umbra	(151.63023583333099964 -32.87799816666579744 0)	No
C. maculata	(151.63006636013599859 -32.8781377394651031 0)	No
E. fibrosa	(151.63012699999700317 -32.87806699999919857 0)	No
C. maculata	(151.63006716666399143 -32.87814999999920218 0)	No
C. maculata	(151.63010566666400791 -32.87816016666590002 0)	No
E. umbra	(151.63012433333099693 -32.87818366666589753 0)	No
E. fibrosa	(151.63002383333099488 -32.87801883333249719 0)	No
E. fibrosa	(151.62999766666399637 -32.87801116666589962 0)	No
E. fibrosa	(151.62999766666101209 -32.87801116666509671 0)	No
C. maculata	(151.62999119742400467 -32.87805006252430218 0)	No
E. umbra	(151.62999133333099167 -32.87808499999920286 0)	No
E. umbra	(151.63019283333099452 -32.87804466666590031 0)	No
C. maculata	(151.63019699999699696 -32.87798316666589926 0)	No
E. umbra	(151.63021023136599297 -32.87794230098180037 0)	No
E. fibrosa	(151.63012366666399089 -32.87802966666590265 0)	No
E. umbra	(151.63010516666400918 -32.87801966666589948 0)	No
E. punctata	(151.6300821666640104 -32.87798149999920128 0)	No
E. fibrosa	(151.63004333333100249 -32.87814233333249803 0)	No
E. fibrosa	(151.63001980780100553 -32.87811788439110217 0)	No
E. umbra	(151.63018909773501264 -32.87804835288009997 0)	No
E. fibrosa	(151.63019999999698939 -32.87805566666580148 0)	No
E. punctata	(151.63022133333100783 -32.87810799999920164 0)	No
E. umbra	(151.63009533333101331 -32.8781018333325008 0)	No

E. umbra	(151.63009233333099246 -32.87806633333249806 0)	No
SAT #8		
Tree Species	**GPS Coordinates**	**Scat Present**
C. maculata	(151.63177549999699067 -32.87815999999919825 0)	No
E. acmenoides	(151.63172908360701285 -32.87802166611359667 0)	No
C. maculata	(151.63172486175301401 -32.87799439715700345 0)	No
E. acmenoides	(151.63170883333100392 -32.87798833333250315 0)	No
E. fibrosa	(151.63167667749900147 -32.87800459305219647 0)	No
E. capitellata	(151.63171149999701015 -32.87808949999919861 0)	No
E. fibrosa	(151.63167757169799188 -32.87815142538560309 0)	No
E. fibrosa	(151.63167766666398961 -32.87814599999919807 0)	No
C. maculata	(151.63166110375200901 -32.87817761948159756 0)	No
E. fibrosa	(151.63166407250301404 -32.87816898187290349 0)	No
C. maculata	(151.63168149999700063 -32.87819149999919688 0)	No
E. acmenoides	(151.63156783333099042 -32.87808816666589706 0)	No
C. maculata	(151.63183983333098581 -32.87807299999919763 0)	No
E. fibrosa	(151.63178533333100972 -32.87799633333249716 0)	No
C. maculata	(151.63179349999700207 -32.87799533333249968 0)	No
E. fibrosa	(151.6317955868549916 -32.87796829225320039 0)	No
C. maculata	(151.63163749999699803 -32.87809716666590276 0)	No
C. maculata	(151.6318144999970059 -32.87797283333249965 0)	No
E. punctata	(151.63165849999700185 -32.87808849999920113 0)	No
E. acmenoides	(151.63166818368000577 -32.87804288776089834 0)	No
C. maculata	(151.63163199999701192 -32.87800049999920304 0)	No
C. maculata	(151.63161849999698916 -32.8779911666658009 0)	No
E. punctata	(151.63160283333098732 -32.87802087798309714 0)	No
C. maculata	(151.63159474142298677 -32.87802551021110276 0)	No
E. fibrosa	(151.63171716666400357 -32.87813835417109942 0)	No
E. fibrosa	(151.63162824016001196 -32.87802943788540233 0)	No
C. maculata	(151.63174098065701401 -32.87804762581379947 0)	No
E. capitellata	(151.63181333333099587 -32.87809533890580127 0)	No
E. fibrosa	(151.63180399999700398 -32.87809699999920099 0)	No
C. maculata	(151.63177249999699825 -32.87809816666590024 0)	No
SAT #9		
Tree Species	**GPS Coordinates**	**Scat Present**
E. fibrosa	(151.62846533333100751 -32.87948849999919787 0)	No
C. gummifera	(151.62841883333101123 -32.87946699999920241 0)	No
E. umbra	(151.62844366160601339 -32.87940722582840181 0)	No
E. umbra	(151.62842233333100239 -32.879342499999197 0)	No
E. umbra	(151.62842449999700989 -32.87931483333260019 0)	No
E. umbra	(151.62841416666398686 -32.87928833333249656 0)	No
E. fibrosa	(151.62852068240300696 -32.87937845462860054 0)	No
E. acmenoides	(151.62856466666400479 -32.87946466666590339 0)	No
E. umbra	(151.62850474293401248 -32.87949323540490099 0)	No
C. maculata	(151.62849066666399267 -32.87947999999919801 0)	No

E. fibrosa	(151.62850166666399332 -32.87949516666589744 0)	No
C. gummifera	(151.62865699999699132 -32.87931066666590141 0)	No
W. fibrosa	(151.62865099999700647 -32.87941316666589842 0)	No
E. fibrosa	(151.62858916666399978 -32.8794809999992026 0)	No
E. fibrosa	(151.62859049999698868 -32.87948633333250115 0)	No
C. gummifera	(151.62854699999701324 -32.87934466666590083 0)	No
C. maculata	(151.62850390060000905 -32.87929820642499834 0)	No
E. umbra	(151.62851266666399397 -32.87937366666589867 0)	No
E. acmenoides	(151.62855166666400919 -32.87928666666579858 0)	No
C. maculata	(151.62861183333100712 -32.87928049999919722 0)	No
C. maculata	(151.62864467850698702 -32.87924875245460044 0)	No
C. maculata	(151.62861481233900918 -32.87922786943430253 0)	No
C. maculata	(151.62857999999698677 -32.87924683333250186 0)	No
C. maculata	(151.62861399999698619 -32.8794084999992009 0)	No
E. fibrosa	(151.62859527872700482 -32.87950699857120185 0)	No
E. fibrosa	(151.62855533333100766 -32.87933433333250122 0)	No
C. maculata	(151.62855566666399909 -32.87932883333250089 0)	No
E. umbra	(151.62860866666400739 -32.87935683333250125 0)	No
E. umbra	(151.62861366666399476 -32.87937316666589993 0)	No
E. fibrosa	(151.62860482769099235 -32.87938796616259651 0)	No
SAT #10		
Tree Species	**GPS Coordinates**	**Scat Present**
C. maculata	(151.6269102649050069 -32.88063730579219879 0)	No
E. umbra	(151.62689049999698909 -32.8806589999991985 0)	No
E. umbra	(151.62690466666398947 -32.88067716666589746 0)	No
E. globoidea	(151.62701749999700951 -32.88071366666589768 0)	No
C. maculata	(151.62704283333098942 -32.88073383333249922 0)	No
C. maculata	(151.6269038333309993 -32.88072033333249777 0)	No
C. maculata	(151.6267559751190106 -32.88069516915999912 0)	No
C. maculata	(151.62676799999701416 -32.88064799999919785 0)	No
E. umbra	(151.62675216666400502 -32.88066299999920261 0)	No
C. maculata	(151.62687199999700738 -32.88062433333249857 0)	No
C. maculata	(151.62688483333099043 -32.88063933333250333 0)	No
E. umbra	(151.6269918333310045 -32.88058399999920312 0)	No
C. maculata	(151.62696916637901268 -32.88058010876920179 0)	No
C. maculata	(151.62680966666400195 -32.88076299999919883 0)	No
E. fibrosa	(151.62684299999699533 -32.88081933333249651 0)	No
E. fibrosa	(151.62683716666398936 -32.88084833333250145 0)	No
C. maculata	(151.62685181521899835 -32.88084109601209803 0)	No
E. globoidea	(151.62698406813601082 -32.88075801808879817 0)	No
E. globoidea	(151.62695016666398828 -32.88071716666590305 0)	No
E. fibrosa	(151.62705716666400235 -32.88070149999919778 0)	No
C. maculata	(151.62704683333100775 -32.88067333333260223 0)	No
E. globoidea	(151.6270488333310027 -32.8806964999992033 0)	No
C. maculata	(151.6270138333310058 -32.88063283333249842 0)	No

C. maculata	(151.62701199999699497 -32.88060499999919983 0)	No
E. umbra	(151.62676516666400062 -32.88073099999920146 0)	No
C. maculata	(151.62693849999701001 -32.88078833333249662 0)	No
E. globoidea	(151.62689740527500248 -32.88077521583319651 0)	No
E. umbra	(151.62683866091200002 -32.88077967241780186 0)	No
C. maculata	(151.62679416666401266 -32.8807094999991989 0)	No
E. punctata	(151.62684999999700608 -32.88072299999920034 0)	No
SAT #11		
Tree Species	**GPS Coordinates**	**Scat Present**
C. maculata	(151.62858749999699626 -32.88074016666590182 0)	No
C. maculata	(151.6284808333309968 -32.88077749999919774 0)	No
E. umbra	(151.62842399999701115 -32.88083266666590276 0)	No
C. maculata	(151.62834449999701292 -32.88075066666589663 0)	No
E. umbra	(151.62841733333098659 -32.88080866666589941 0)	No
C. maculata	(151.62850213053499715 -32.88070083435420088 0)	No
C. maculata	(151.62857766666400039 -32.8805768333324977 0)	No
C. maculata	(151.62860266666399411 -32.88065333333250351 0)	No
E. umbra	(151.62859516666401305 -32.88067016666590092 0)	No
E. umbra	(151.62856899999698612 -32.88069099999920297 0)	No
C. maculata	(151.62857999999698677 -32.88070733333250217 0)	No
E. fibrosa	(151.62837983333099601 -32.880655666665902 0)	No
E. umbra	(151.62837569304500107 -32.88061412709460285 0)	No
E. umbra	(151.62837349999699654 -32.88059449999919792 0)	No
E. umbra	(151.62843933333098789 -32.88051549999919843 0)	No
C. maculata	(151.62849099999701252 -32.88063366666590071 0)	No
E. fibrosa	(151.62839216666401398 -32.88054349999919879 0)	No
E. umbra	(151.62849190816299938 -32.88067903288529692 0)	No
E. fibrosa	(151.62836584785799232 -32.88071805384399937 0)	No
E. umbra	(151.62838637114799667 -32.88072161573499841 0)	No
C. maculata	(151.62836716666399184 -32.88068183333250261 0)	No
E. umbra	(151.62838816666399566 -32.88072083333249651 0)	No
E. umbra	(151.62838249999700224 -32.88065421978789971 0)	No
C. maculata	(151.62852183333100697 -32.88055266666589915 0)	No
W. fibrosa	(151.62839216666199604 -32.88054349999840298 0)	No
E. umbra	(151.628426766226994 -32.88063704449219671 0)	No
C. maculata	(151.628460999997003 -32.88060566666590034 0)	No
E. umbra	(151.62844349999699034 -32.88062699999920113 0)	No
E. fibrosa	(151.62849366666401352 -32.88061249999920221 0)	No
E. umbra	(151.62846333333101256 -32.88055283333250145 0)	No

Appendix F BAM Credit Report Summary

BAM Credit Summary Report

Proposal Details

Assessment Id
00033925/BAAS17044/22/00033926

Proposal Name
19082 - 505 Minmi Rd BCAR

BAM data last updated *
22/06/2023

Assessor Name
Matt Doherty

Report Created
27/10/2023

BAM Data version *
61

Assessor Number
BAAS17044

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
2

Assessment Type
Biocertification

* 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.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Smooth-barked Apple - Red Bloodwood - Brown Stringybark - Hairpin Banksia heathy open forest of coastal lowlands												
7	1619_Low	Not a TEC	56.4	56.4	0.94	PCT Cleared - 45%	High Sensitivity to Gain			1.50		20
											Subtotal	**20**

Spotted Gum - Broad-leaved Mahogany - Grey Gum grass - shrub open forest on Coastal Lowlands of the Central Coast												
1	1589_Moderate	Not a TEC	81.9	81.9	0.58	PCT Cleared - 71%	High Sensitivity to Gain			2.00		24
2	1589_Moderate_A_costata	Not a TEC	64.4	64.4	0.21	PCT Cleared - 71%	High Sensitivity to Gain			2.00		7
3	1589_Low	Not a TEC	72.9	72.9	0.4	PCT Cleared - 71%	High Sensitivity to Gain			2.00		15
											Subtotal	**46**
Spotted Gum - Broad-leaved Mahogany - Red Ironbark shrubby open forest												
4	1590_Moderate	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	81.9	81.9	8.2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		336
5	1590_Low	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	75.3	75.3	0.37	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		14

6	1590_Low_M_nodosa	Lower Hunter Spotted Gum Ironbark Forest in the Sydney Basin and NSW North Coast Bioregions	50.7	50.7	1.7	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		44
											Subtotal	**394**
											Total	**460**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Myotis macropus / Southern Myotis (Fauna)									
1589_Moderate	81.9	81.9	0.57	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	23
1589_Low	72.9	72.9	0.22	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	8

1590_Moderate	81.9	81.9	0.44	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	18
1590_Low	75.3	75.3	0.04	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2
								Subtotal	**51**
Petaurus norfolcensis / Squirrel Glider (Fauna)									
1589_Moderate	81.9	81.9	0.58	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	24
1589_Moderate _A_costata	64.4	64.4	0.21	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	7
1589_Low	72.9	72.9	0.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	15
1590_Moderate	81.9	81.9	8.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	336

1590_Low	75.3	75.3	0.37	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	14
1590_Low_M_nodosa	50.7	50.7	1.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	44
1619_Low	56.4	56.4	0.94	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	26
								Subtotal	**466**

Appendix G EPBC Likelihood of Occurrence Table

EPBC Likelihood of Occurrence

Community Name	Status	Habitat Requirement	Impact Assessment Required
Threatened Ecological Communities			
Central Hunter Valley eucalypt forest and woodland	Critically Endangered	It comprises eucalypt woodlands and open forests; typically with a shrub layer of variable density and/or a grassy ground layer. Across its range, one or more of a complex of four eucalypt tree species typically dominate the canopy. The ecological community occurs in the Hunter Valley region (primarily in the Central Hunter). It is characterised by rolling hills and wide valleys, with a meandering river system on a wide flood plain. The geology of the Hunter Valley region's landscape includes Permian shales, sandstones, conglomerates, volcanics and coal measures. This TEC was not detected within the subject land.	Unlikely
Coastal Swamp Oak (*Casuarina glauca*) Forest of New South Wales and South East Queensland ecological community	Endangered	The ecological community occurs in sub-tropical, sub-humid and temperate climatic zones from Curtis Island, north of Gladstone, in Queensland to Bermagui in southern New South Wales. The ecological community occurs in coastal catchments, mostly at elevations of less than 20 m above sea-level (ASL) that are typically found within 30 km of the coast. However, this distance varies by catchment. Coastal Swamp Oak Forest typically occurs on unconsolidated sediments, including alluvium deposits, and where soils formed during the Quaternary period as a result of sea-level rise during the Holocene period (Sloss et al., 2007). These are most typically hydrosols, which are saturated with water for long periods of time (typically grey-black clay-loam and/or sandy loam soils). The ecological community can also occur on organosols (peaty soils). This TEC was not detected within the subject land.	Unlikely
Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland	Endangered	The ecological community is associated with forested palustrine wetlands, or swamp forests, found in the temperate to subtropical coastal valleys of Australia's east coast, and occurs between the Great Dividing Range and the coastline from near Gladstone in Queensland, through to the south coast of New South Wales.	Unlikely

Community Name	Status	Habitat Requirement	Impact Assessment Required
		This TEC was not detected within the subject land.	
Lowland Rainforest of Subtropical Australia	Critically Endangered	The ecological community primarily occurs from Maryborough in Queensland to the Clarence River (near Grafton) in New South Wales (NSW). The ecological community also includes isolated areas between the Clarence River and Hunter River such as the Bellinger and Hastings valleys. The ecological community occurs on basalt and alluvial soils, including sand and old or elevated alluvial soils as well as floodplain alluvia. It also occurs occasionally on enriched rhyolitic soils and basaltically enriched metasediments. This TEC was not detected within the subject land.	Unlikely
River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria	Critically Endangered	The River-flat eucalypt forest on coastal floodplains of southern New South Wales and eastern Victoria is found in the South East Corner (SEC) and Sydney Basin (SYB) IBRA bioregions. The ecological community occurs on alluvial landforms related to coastal river floodplains and associated sites where transient water accumulates, including floodplains, river-banks, riparian zones, lake foreshores, creek lines (including the floors of tributary gullies), floodplain pockets, depressions, alluvial flats, fans, terraces, and localised colluvial fans. This TEC was not detected within the subject land.	Unlikely
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	This EEC occurs within a relatively narrow margin of the Australian coastline, within the subtropical and temperate climatic zones south of the South-east Queensland IBRA bioregion boundary at 23° 37' latitude along the east coast and south of (and including) Shark Bay at 26° on the west coast. It is typically restricted to the upper intertidal environment, occurring in areas within the astronomical tidal limit, often between the elevation of the mean high tide and the mean spring tide. Associated sediments generally consist of poorly-sorted anoxic sandy silts and clays, and may have salinity levels that are much higher than seawater due to evaporation. This TEC was not detected within the subject land.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Birds				
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-Oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. The Regent Honeyeater is a generalist forager, although it feeds mainly on the nectar from a relatively small number of eucalypts that produce high volumes of nectar. Key eucalypt species include Mugga Ironbark, Yellow Box, White Box and Swamp Mahogany. Other tree species may be regionally important. For example, the Lower Hunter Spotted Gum forests have recently been demonstrated to support regular breeding events. Flowering of associated species such as Thin-leaved Stringybark *Eucalyptus eugenioides* and other Stringybark species, and Broad-leaved Ironbark *E. fibrosa* can also contribute important nectar flows at times. The species is associated with PCTs present within the subject land (PCT 1589 and 1590). Mistletoe was observed during field surveys, however the area is not a Mapped Important Area for breeding or foraging for this species. Additionally, several key Eucalypt species are present within the subject land. There are six records within a 10 km Bionet search.	**Likely**
Botaurus poiciloptilus	Australasian Bittern	Endangered	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha spp*.) and spikerushes (*Eleocharis spp*.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds; there are usually six olive-brown eggs to a clutch.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			The species is not associated with any of the identified PCTs on the site. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. Additionally, the waterbody will be retained through the proposal. There are 48 records within a 10 km Bionet search. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). Owing to the lack of suitable habitat, it is unlikely that the species occurs within the subject land.	
Calidris canutus	Red Knot	Endangered	The Red Knot is common in all the main suitable habitats around the coast of Australia. They mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They move south, mostly along coasts, with some inland records from September–November and arrive in south-west Australia from September. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). There are 24 records within a 10 km Bionet search. It is unlikely that the species occurs within the subject land.	Unlikely
Calidris ferruginea	Curlew Sandpiper	Critically Endangered, Migratory	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. The species is not associated with any of the identified PCTs on the site. A single waterbody is present within the subject land, however the subject land contains limited suitable foraging habitat. Additionally, the waterbody will be retained through	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			the proposal. There are 141 records of the species within a 10 km Bionet search. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). Owing to the lack of suitable habitat, it is unlikely that the species occurs within the subject land.	
Calidris tenuirostris	Great Knot	Critically Endangered, Migratory	The Great Knot has been recorded in Narooma, Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November. No suitable habitat occurs within the subject land. Nine records exist within a 10 km Bionet search. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	Unlikely
Charadrius leschenaultii	Greater Sand Plover	Vulnerable	In Australia, the Greater Sand Plover occurs in coastal areas in all states. n the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons, and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. The species is not associated with any PCTs present within the site. No suitable habitat is present within the subject land. No Bionet records of the species within 10 km of the subject land boundary. It is however, located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	Unlikely
Charadrius mongolus	Lesser Sand Plover	Endangered	The Lesser Sand Plover breeds in central and north eastern Asia, migrating further south for winter. Occurs almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Roosts	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge. The species is not associated with any PCTs present within the site. No suitable habitat is present within the subject land. No Bionet records of the species within 10 km of the subject land boundary. It is however, located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	
Erythrotriorchis radiatus	Red Goshawk	Vulnerable	Inhabit open woodland and forest, preferring a mosaic of vegetation types as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, *Melaleuca* swamp forest and riparian *Eucalyptus* forest of coastal rivers. The species is not associated with any PCTs present within the site. Although the subject land does comprise a form of riparian *Eucalyptus/Melaleuca* forest this does not occur on a coastal river, instead only adjacent to a 1st order ephemeral stream. No suitable habitat occurs within the subject land. No Bionet records of the species within 10 km of the subject land.	Unlikely
Falco hypoleucos	Grey Falcon	Vulnerable	The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey. The species is not associated with any PCTs present within the site and is not within the species known or predicted range. No Bionet records of the species exists within 10 km of the subject land boundary. It is unlikely that the species occurs within the site.	Unlikely
Grantiella picta	Painted Honeyeater	Vulnerable	The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			During the winter it is more likely to be found in the north of its distribution. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. A specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias. Prefers mistletoes of the genus Amyema. The species is associated with PCTs present within the subject land (PCT 1589, 1590 and 1619). Mistletoe was observed during field surveys. however, no Bionet records of the species exists within 10 km of the subject land boundary. The subject land does not contain any of the favoured vegetation formations of which the species inhabits, therefore It is unlikely that the species occurs within the site.	
Hirundapus caudacutus	White-throated Needletail	Vulnerable	The White-throated Needletail is widespread in across the coast of eastern and south-eastern Australia, and Tasmania. White-throated Needletails only occur as vagrants in the Northern Territory and in Western Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable (Cramp 1985), but there are, nevertheless, certain preferences exhibited by the species. They are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. The species is associated with PCTs present within the site (1589 and 1590). Suitable habitat is present in the form of open forests. A total of 95 Bionet records of the species exist within 10 km of the subject land boundary. The species is predominantly aerial; however, the subject land serves as potential habitat for the species.	**Likely**
Lathamus discolor	Swift Parrot	Critically Endangered	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany	**Likely**

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			Eucalyptus robusta, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*. Commonly used lerp infested trees include Inland Grey Box *E. microcarpa*, Grey Box *E. moluccana* and Blackbutt *E. pilularis*. Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *Eucalyptus globulus*. The species is associated with PCTs present within the subject land (1589 and 1590). The subject land comprises suitable winter foraging habitat such as Spotted Gum, however the study area is not located within draft Important Mapped Areas for this species (confirmed via email with DPIE 2020). A total of 15 Bionet records of the species exist within 10 km of the subject land boundary. Therefore, there is potential that the subject land serves as habitat for the species.	
Limosa lapponica baueri	Bar-tailed Godwit	Vulnerable	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas. No suitable habitat occurs within the subject land. A total of 66 Bionet records of the species exist within 10 km of the subject land boundary. It is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	Unlikely
Numenius madagascariensis	Eastern Curlew	Critically Endangered, Migratory	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states and rarely inland. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms. The species is not associated with any PCTs present within the subject land. A total of 23 Bionet records of the species exist within 10 km of the subject land boundary. It is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	
Rostratula australis	Australian Painted Snipe	Endangered	Most records of the Australian Painted Snipe are from the south east, particularly the Murray Darling Basin, with scattered records across northern Australia and historical records from around the Perth region in Western Australia. In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The species is not associated with any PCTs present within the subject land. The species is not associated with any of the identified PCTs on the site. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. Additionally, the waterbody will be retained through the proposal. A total of two Bionet records of the species exist within 10 km of the subject land boundary. It is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	Unlikely
Sternula nereis nereis	Australian Fairy Tern	Vulnerable	Within Australia, the Fairy Tern occurs along the coasts of Victoria, Tasmania, South Australia and Western Australia; occurring as far north as the Dampier Archipelago near Karratha. The subspecies has been known from New South Wales (NSW) in the past, but it is unknown if it persists there. The species is not associated with any PCTs present within the subject land. No Bionet records of the species exist within 10 km of the subject land boundary. It is	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	
Thinornis cucullatus cucullatus	Eastern Hooded Plover	Vulnerable	Inhabits sandy ocean beaches, tidal bays, estuaries, rock platforms, rocky sand-covered reefs, coastal intermittently open/closed lakes/lagoons and saltmarsh. The species is not associated with any PCTs present within the subject land. No Bionet records of the species exist within 10 km of the subject land boundary. It is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	Unlikely
Frogs				
Heleioporus australiacus	Giant burrowing Frog	Vulnerable	The Giant Burrowing Frog is distributed in south eastern NSW and Victoria, and appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. The species is not associated with any PCTs present within the subject land. The site does not comprise swamps on sandstone plateaus and deeply dissected gullies, which are important habitat features for this species. Furthermore, no records exist within the locality based on a 10 km OEH Bionet search. It is unlikely that the species occurs within the site.	Unlikely
Litoria aurea	Green and Golden Bell Frog	Vulnerable	The Green and Golden Bell Frog main populations in NSW are located around the metropolitan areas of Sydney, Shoalhaven and mid north coast (one an island population). There is only one known population on the NSW Southern Tablelands. Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (*Typha spp*.) or spikerushes (*Eleocharis spp*.). Optimum habitat includes water-bodies that are unshaded, free of predatory fish such as Plague Minnow (*Gambusia*	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			holbrooki), have a grassy area nearby and diurnal sheltering sites available. Some sites, particularly in the Greater Sydney region occur in highly disturbed areas. The species is associated with PCTs present within the subject land (PCT 1590 and 1619) and the subject land contains suitable habitat in the form of an ephemeral water body with suitable vegetation in the form of bull-rushes and an adjacent grassy area. The single watercourse and waterbody will be retained as C2 Environmental Conservation, the habitat does not fall within the subject land. Over 9000 Bionet records exist within the locality based on a 10 km OEH Bionet search. The species was surveyed for in accordance with the TBDC guidelines, no species were detected, therefore no further assessment is required.	
Mixophyes balbus	Stuttering Frog	Vulnerable	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. It is the only *Mixophyes* species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney, and Dorrigo being the stronghold. The species is not associated with any PCTs present within the subject land. No suitable habitat exists in the form of wet tall forests or deep permanent pools for tadpole development. Furthermore, no Bionet records exists within a 10 km search. As such, it is unlikely the species occurs on the site and no further survey is required.	Unlikely
Mixophyes iteratus	Giant Barred Frog	Vulnerable	The Giant Barred Frog is distributed along the coast and ranges from Eumundi in south-east Queensland to Warrimoo in the Blue Mountains. Declines appear to have occurred at the margins of the species' range, with no recent records south of the Hawkesbury River and disappearances from a number of streams in QLD. Northern NSW, particularly the Coffs Harbour-Dorrigo area, is a stronghold. Giant Barred Frogs are found along freshwater streams with permanent or semi-permanent water, generally (but not always) at lower elevation. Moist riparian habitats such as rainforest or wet sclerophyll forest are favoured for the deep leaf litter that they provide for shelter and foraging, as well as open perching sites on the forest floor.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			However, Giant Barred Frogs will also sometimes occur in other riparian habitats, such as those in drier forest or degraded riparian remnants, and even occasionally around dams. The species is not associated with any PCTs present within the subject land. There is one ephemeral 1st order stream exists within the subject land, leaf litter was minimal, and there are no records within the 10 km OEH Bionet search. It is unlikely that the species occurs within the site.	
Uperoleia mahonyi	Mahony's Toadlet	Endangered	Mahony's Toadlet is endemic to the mid-north coast of New South Wales (NSW) and to date has been found between Kangy Angy and Seal Rocks. Current observations indicate Mahony's Toadlet inhabits ephemeral and semi-permanent swamps and swales on the coastal fringe of its range. Known records occur in heath or wallum habitats almost exclusively associated with leached (highly nutrient impoverished) white sand. Known records are associated with shallow ephemeral/semi-permanent water bodies with limited flow of water. The species is associated with PCTs present within the subject land (PCT 1619). One ephemeral 1st order stream occurs within the subject land, however no swamps or swales are present. No wallum or highly leached habitat is present within the site. No records exist within the 10km OEH Bionet search. It is unlikely that the species occurs within the site.	Unlikely
Mammals				
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Found mainly in areas with extensive cliffs and caves. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			The species is associated with PCTs present within the subject land (PCT 1589 and 1619). Results from the Anabat express echo-location call recorders contained a possible recording of this species, however no potential roosting habitat is present within the subject land in the form of caves, cliffs, disused mines. Additionally, potential breeding and foraging habitat was assessed in accordance with the 'Species credit' threatened bats and their habitat – NSW survey guide for the BAM (OEH 2018), the assessment is demonstrated in **Table 7**. No breeding habitat was determined present within or in close proximity to the subject land, additionally vegetation within the subject land did not qualify as foraging habitat for the species. Therefore, no habitat is present for the species within the subject land, no further assessment is required.	
Dasyurus maculatus maculatus (SE mainland population)	Spotted-tail Quoll	Endangered	The spotted-tailed Quoll is recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. The species is associated with PCTs present within the subject land (PCT 1589, 1590 and 1619). The subject land comprises a moderate sized patch of native vegetation. There is little suitable habitat in the form of suitable fallen logs and few suitable hollow bearing trees exist within the subject land. The land is in reasonable condition given the historic disturbance. Four records exist within the OEH 10 km Bionet search. Owing to the generalist nature of the species, there is potential for the species to occur within the subject land.	**Likely**
Petauroides volans	Greater Glider	Vulnerable	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest), with an elevational range from sea level to 1200 m above sea level. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species. Roosts in tree hollows and is more common in areas abundant in tree hollows. The species is associated with PCTs present within the subject land (PCT 1589, 1590 and 1619). No old growth trees occur within the subject land, however tree	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			hollows are present within the site. The vegetation within the subject land may be broadly appropriate. Additionally, 10 records are within the 10 km EOH search area. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the subject land.	
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable	The range of the Brush-tailed Rock-wallaby extends from south-east Queensland to the Grampians in western Victoria, roughly following the line of the Great Dividing Range. However the distribution of the species across its original range has declined significantly in the west and south and has become more fragmented. In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. The species is associated with PCTs present within the subject land (PCT 1589 and 1619). The subject land contains several rocky outcrops, however not likely enough to qualify as appropriate habitat for the species. No records exist as defined on the OEH BioNet Atlas using a 10 km search radius of the locality. Additionally, the species was not encountered during any survey or site visit, given the conspicuous nature of the species, it is unlikely to be present on the subject land.	Unlikely
Phascolarctos cinereus	Koala	Vulnerable	Inhabit eucalypt woodlands and forests in a fragmented distribution throughout eastern Australia. In NSW this species mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range but have been recorded in the southern tablelands. This species feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. 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.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			The species is associated with PCTs present within the subject land (PCT 1589, 1590 and 1619). It is unlikely this species would occur within the study area due to difficult accessibility such as; fences, the limited/fragmented connection to larger tracts of bushland in the area, proximity to residential housing development indicating a high number of dogs in the area, and main roads/highways hugging the northern fringe of the subject land. Larger areas of better-quality vegetation occur within the locality indicating the species is not dependent on the available habitat within the impacted area for breeding or important life cycle periods. However as the BCAR submission is a component of the Planning Proposal process, no Koala Assessment Report (KAR) under the SEPP 2021 is required. Though it is noted that a total of nine Koala Use Species as listed by the SEPP were recorded, making up >15% of the overall canopy. Additionally, 49 records exist as defined on the OEH BioNet Atlas using a 10km search radius of the locality, however no records were within 2.5 km of the study area. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	
Potorous tridactylus tridactylus	Long-nosed Potoroo (SE mainland)	Vulnerable	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The species is not associated with any PCTs present within the subject land. No suitable habitat in the form of coastal heaths or wet sclerophyll forests occur within the subject land. Dry sclerophyll forest does occur, however the understorey is made of dense grasses only. Furthermore, no records exist as defined on the OEH Bionet using a 10 km search radius of the locality.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Pseudomys novaehollandiae	New Holland Mouse	Vulnerable	The New Holland Mouse has a fragmented distribution across Tasmania, Victoria, NSW and Queensland. The species is now largely restricted to the coast of central and northern NSW, with one inland occurrence near Parkes. The New Holland Mouse has been found from coastal areas and up to 100 km inland on sandstone country. The species has been recorded from sea level up to around 900 m above sea level. Soil type may be an important indicator of suitability of habitat for the New Holland Mouse, with deeper top soils and softer substrates being preferred for digging burrows (Wilson & Laidlaw 2003). In Victoria, the species has been recorded on deep siliceous podsols, sandy clay, loamy sands, sand dunes and coastal dunes. Due to the largely granivorous diet of the species, sites where the New Holland Mouse is found are often high in floristic diversity, especially leguminous perennials. The mouse is known to inhabit open heathland, open woodland with a heathland understorey and vegetated sand dunes. The species is not associated with any PCTs present within the subject land. No suitable habitat in the form of heathlands or vegetated sand dunes exist within the subject land. Furthermore, no records exist as defined on the OEH Bionet using a 10 km search radius of the locality.	Unlikely
Pteropus poliocephalus	Grey-headed Flying Fox	Vulnerable	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia, from Rockhampton in Queensland to Adelaide in South Australia. In times of natural resource shortages, they may be found in unusual locations. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. The species is associated with PCTs present within the subject land (PCT 1589, 1590 and 1619). Suitable foraging habitat is present within the subject land in the form of *Eucalyptus* spp. Similar habitat to the subject land is widely distributed in the local area, indicating the species is not dependent on the available habitat within the impacted area for breeding or important life cycle periods. No known roosting colonies are present on/or close to the site (as per the National Flying-Fox	**Likely**

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			Monitoring Viewer, Department of Agriculture, Water and the Environment). The species was observed multiple times foraging within the subject land.	
Reptiles				
Hoplocephalus bungaroides	Broad-headed Snake	Vulnerable	The Broad-headed Snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney. Nocturnal. Shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in crevice's or hollows in large trees within 500m of escarpments in summer. Feeds mostly on geckos and small skinks; will also eat frogs and small mammals occasionally. The species is not associated with any PCTs present within the subject land. There are some appropriate habitat features within the subject land (crevices and hollows), however not within 500 m of an escarpment. Furthermore, there are no records are within the OEH BioNet 10 km search radius.	Unlikely
Plants				

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Acacia bynoeana	Bynoe's Wattle	Vulnerable	Vulnerable 'Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations in heath or dry sclerophyll forest on sandy soils. Seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple. The species is associated with PCTs present within the subject land (PCT 1589 and 1619). The vegetation within the subject land comprises a dry & wet sclerophyll forest formation, of which only one of the listed over-storey species (*C. gummifera*) associated with the threatened species occurs. Although there are no records within the locality as defined on the OEH BioNet using a 10 km search radius of the locality. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	Unlikely
Angophora inopina	Charmhaven Apple	Vulnerable	Endemic to the Central Coast region of NSW. Is lignotuberous, allowing vegetative growth to occur following disturbance. However, such vegetative reproduction may suppress the production of fruits/seeds, necessary for the recruitment of new individuals to a population, and the time between such disturbance and the onset of sexual reproduction is not known. Occurs most frequently in four main vegetation communities: (i) *Eucalyptus haemastoma–Corymbia gummifera–Angophora inopina woodland/forest;* (ii) *Hakea teretifolia–Banksia oblongifolia* wet heath; (iii) *Eucalyptus resinifera–Melaleuca sieberi–Angophora inopina* sedge woodland; (iv) *Eucalyptus capitellata–Corymbia gummifera–Angophora inopina* woodland/forest. The species is not associated with any PCTs present within the subject land. Additionally, the subject land is not within the LGAs of Cessnock or Singleton. Further survey is not required.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Caladenia tessellata	Thick-lipped Spider-orchid	Vulnerable	Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. The single leaf regrows each year. The species is not associated with any PCTs present within the subject land. The subject land is located outside of its known geographic distribution; thus, no records exist within the locality as defined on the OEH Bionet using a 10 km search radius of the locality. Therefore, the species is unlikely to be present within the site.	Unlikely
Commersonia prostrata	Dwarf Kerrawang	Endangered	Grows in patches of *Themeda australis* (Kangaroo Grass) amongst shrubs and sedges in heathland and woodland. The presence of other orchid species and therefore micorrhyza assemblages can, though not always, be an indication of suitable habitat. Associated vegetation at known populations is described as dry sclerophyll woodland dominated by *Eucalyptus haemastoma* (Scribbly Gum), *Corymbia gummifera* (Red Bloodwood), *Angophora costata* (Smooth-barked Apple) and *Allocasuarina littoralis* (Black She-oak). The species has been recorded in disturbed locations, including in areas lacking upper vegetation strata. Most sites have a mostly native understorey. Marginal suitable vegetation occurs within the subject land in the form of PCT 1619 dominated by *Angophora costata* and *Corymbia gummifera*, as a very small and disturbed area. No known populations are recorded as defined by on the OEH Bionet using a 10 km search radius of the locality. Therefore, the species is unlikely to be present within the site.	Unlikely
Cryptostylis hunteriana	Leafless Tongue-orchid	Vulnerable	This species is known to be extremely cryptic as it does not flower each year. Known to occur within a wide range of habitats including woodlands to swamp heaths. Within the Hunter region larger populations have been typically found in woodland dominated by *Eucalyptus racemosa* (Scribbly Gum) and it prefers areas with an open grassy understorey. The species typically prefers moist sandy soils in sparse to dense heath and sedge land, or moist to dry clay loams in coastal forests. This species is known to occur in association with *C. subulata* and *C. erecta.*	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			The species is associated with PCTs present within the subject land (PCT 1589, 1590 and 1619). The subject land comprises of marginal habitat in the form of open grassy understorey, however due to past disturbance the grass layer is very dense in areas with potential habitat, which is not optimal conditions for successful flowering. Additionally, no associated species occur within the study area. Furthermore, this species has not been recorded within a 10 km search of the locality as defined on the OEH BioNet Atlas. No species were detected during targeted surveys. Therefore, the species is unlikely to be present within the site.	
Cynanchum elegans	White-flowered Wax Plant	Endangered	The White-flowered Wax Plant usually occurs on the edge of dry rainforest vegetation and other associated vegetation types such as littoral rainforest; coastal scrub and open forest and woodland. Species associated include; 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 Honey myrtle *Melaleuca armillaris* scrub to open scrub. The species is associated with PCTs present within the subject land (PCT 1589 and 1590). The subject land comprises marginal habitat in the form of *Corymbia maculata* dominated dry open forest. Additionally, three records exist within a 10km search of the locality as defined on the OEH BioNet Atlas. Therefore, the species is unlikely to be present within the site. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	Unlikely
Diuris praecox	Newcastle Doubletail	Vulnerable	The habitat of this species is generally on hills and slopes of near coastal districts in open forests which have a grassy to fairly dense understorey. This species grows on well-drained sandy soils (DoEE 2008). The species is associated with PCTs present within the subject land (PCT 1589 and 1619). The vegetation within the study area is a dry sclerophyll forest formation. Although the site contains sandy soils, the site is approximately 13 km away from	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			the coastal fringe (Glenrock SCA & Worimi Conservation Lands) of which this species is recorded. Additionally, no records exist as defined by the OEH Bionet 10 km search. Therefore, the species is unlikely to be present within the site.	
Eucalyptus camfieldii	Camfield's Stringybark	Vulnerable	Restricted distribution in a narrow band with the most northerly records in the Raymond Terrace area south to Waterfall. Localised and scattered distribution includes sites at Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai, Wattamolla and a few other sites in Royal National Park. Occurs mostly in small, scattered stands near the boundary of tall coastal heaths and low open woodland of the slightly more fertile inland areas. Associated species frequently include stunted species of *E. oblonga* Narrow-leaved Stringybark, *E. capitellata* Brown Stringybark and *E. haemastoma* Scribbly Gum. The species is not associated with any PCTs present within the subject land. There is no suitable habitat occurring within the subject land. Furthermore, no records exist as defined by the OEH Bionet 10 km search. Therefore, the species is unlikely to be present within the site.	Unlikely
Eucalyptus glaucina	Slaty Red Gum	Vulnerable	Found only on the north coast of NSW and in separate districts: near Casino where it can be locally common, and farther south, from Taree to Broke, west of Maitland. Grows in grassy woodland and dry eucalypt forest. Grows on deep, moderately fertile and well-watered soils. The species is associated with PCTs present within the subject land (PCT 1589 and 1619). The vegetation within the study area is a dry sclerophyll forest formation, however is east of the known species distribution. Furthermore, there are no OEH Bionet records within the 10 km search area. Regardless of the lack of records, the species was surveyed for opportunistically during flora transect surveys. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Eucalyptus parramattensis subsp. decadens	Earp's Gum	Vulnerable	This species 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. Only two separate meta-populations are recorded, one of which is in the Kurri Kurri area. The species is not associated with any PCTs present within the subject land. There is no suitable habitat within the subject land. Additionally, no records exist as defined by the OEH Bionet 10 km search. Therefore, the species is unlikely to be present within the site.	Unlikely
Euphrasia arguta		Critically Endangered	The current known populations of *Euphrasia arguta* are located in the Nundle State Forest in eucalypt forest with a mixed grass and shrub understorey (D Binns pers. comm. February 2009). This area is located at the junction of the New England Tableland, NSW North Coast, and Nandewar Bioregions. here are no known occurrences of Euphrasia arguta in a conservation reserve. The majority of E. arguta plants are located in Nundle State Forest. A small part of the largest population of *E. arguta* is located on private land that is adjacent to the State Forest. The land is currently used for rough grazing by sheep or cattle. The species is not associated with any PCTs present within the subject land. The subject land is not within the known or predicted distribution of the species. Additionally, no records exist as defined by the OEH Bionet 10 km search. Therefore, the species is unlikely to be present within the site.	Unlikely
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	Vulnerable	This species is sporadically distributed throughout the Sydney Basin with sizeable populations in the Hunter and in the Cessnock - Kurri Kurri area (particularly Werakata NP). Separate populations are also known from Putty to Wyong and Lake Macquarie on the Central Coast. This species grows in sandy or light clay soils usually over thin shales, often with lateritic ironstone gravels and nodules. Occurs in a range of vegetation types from heath and shrubby woodland to open forest, the Hunter in Kurri Sand Swamp Woodland and is also known to occur in *C. maculata-A. costata* open forest. Found over a range of altitudes from flat, low-lying areas to	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			upper slopes and ridge crests. Hunter occurrences are usually 30-70m ASL, while the southern Sydney occurrences are typically at 100-300m ASL. Often occurs in open, slightly disturbed sites such as along tracks. Suitable vegetation occurs within the study area in the formation of dry sclerophyll forest comprising *Corymbia maculata* open forest. All three PCTs (1589, 1590 and 1619) occurring within the study area are commensurate with which this species is associated with. 79 records exist within the locality as defined on the OEH BioNet Atlas using a 10 km search radius. Further survey is required. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	
Grevillea shiressii		Vulnerable	Grows along creek banks in wet sclerophyll forest with a moist understorey in alluvial sandy or loamy soils. Known from two populations near Gosford, on tributaries of the lower Hawkesbury River north of Sydney (Mooney Mooney Creek and Mullet Creek). Both populations occur within the Gosford Local Government Area. There is also a naturalised population at Newcastle. The subject land is located outside of its known geographic distribution. No records exist within the OEH Bionet using a 10 km search radius of the locality.	Unlikely
Melaleuca biconvexa	Biconvex Paperbark	Vulnerable	Biconvex Paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects. Biconvex Paperbark is only found in NSW, with scattered and dispersed populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. The species is associated with PCTs present within the subject land (PCT1589). Seven record exists within the locality as defined on the OEH Bionet Atlas using the 10 km search radius. On this basis further survey is required.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	
Persicaria elatior	Knotweed	Vulnerable	Tall Knotweed has been recorded in south-eastern NSW (Mt Dromedary (an old record), Moruya State Forest near Turlinjah, the Upper Avon River catchment north of Robertson, Bermagui, and Picton Lakes. In northern NSW it is known from Raymond Terrace (near Newcastle) and the Grafton area (Cherry Tree and Gibberagee State Forests). The species also occurs in Queensland. This species normally grows in damp places, especially beside streams and lakes. Occasionally in swamp forest or associated with disturbance. The subject land does not contain any associated PCTs, and no OEH Bionet records exist within the 10 km search radius. Therefore, the species is unlikely to be present within the site.	Unlikely
Pomaderris brunnea	Rufous Pomaderris	Vulnerable	Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria. Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. The species has been found in association with *Eucalyptus amplifolia, Angophora floribunda, Acacia parramattensis, Bursaria spinosa* and *Kunzea ambigua*. Subject land is not within known or predicted distribution and there are no associated PCTs present. No records exist within the OEH Bionet using a 10 km search radius of the locality. Therefore, the species is unlikely to be present within the site.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Prasophyllum sp. Wybong	A Leek Orchid	Critically Endangered	Endemic to NSW, it is known from near Ilford, Premer, Muswellbrook, Wybong, Yeoval, Inverell, Tenterfield, Currabubula and the Pilliga area. Most populations are small, although the Wybong population contains by far the largest number of individuals. The subject land does not contain any associated PCTs. This species is known only to occur in an isolated population in Wybong within the local area. Therefore, the site is located outside of its known geographical distribution. Furthermore, no records exist as defined by on the OEH Bionet using a 10 km search radius of the locality. Therefore, the species is unlikely to be present within the site.	Unlikely
Pterostylis gibbosa	Illawarra Greenhood	Endangered	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage. In the Hunter region, the species grows in open woodland dominated by Narrow-leaved Ironbark *E. crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri*. The subject land does not contain any associated PCTs. There is no suitable habitat within the subject land. Additionally, no OEH Bionet records exist within the 10 km search radius. Therefore, the species is unlikely to be present within the site.	Unlikely
Rhizanthella slateri	Eastern Underground Orchid	Endangered	The Eastern Underground Orchid occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra. Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. No associated PCTs are present within the subject land, no records exist as defined by the OEH Bionet 10km search radius of the locality. Therefore, the species is unlikely to be present within the site.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Rhodamnia rubescens	Scrub Turpentine	Critically Endangered	Occurs in coastal districts north from Batemans Bay in New South Wales, approximately 280 km south of Sydney, to areas inland of Bundaberg in Queensland. Populations of R. rubescens typically occur in coastal regions and occasionally extend inland onto escarpments up to 600 m a.s.l. in areas with rainfall of 1,000-1,600 mm. Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils. No associated PCTs are present within the subject land. The vegetation within the subject land is not appropriate for this species. A total of 20 records exist as defined by the OEH Bionet 10 km search radius of the locality. Therefore, the species is unlikely to be present within the site.	Unlikely
Rhodomyrtus psidioides	Native Guava	Critically Endangered	Occurs from Broken Bay, approximately 90 km north of Sydney, New South Wales, to Maryborough in Queensland. Populations are typically restricted to coastal and sub-coastal areas of low elevation however the species does occur up to c. 120 km inland in the Hunter and Clarence River catchments and along the Border Ranges in NSW. Pioneer species found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest often near creeks and drainage lines. The vegetation within the subject land is not appropriate for this species, no associated PCTs are within the subject land. Four records exist as defined by the OEH Bionet 10 km search radius of the locality. Therefore, the species is unlikely to be present within the site.	Unlikely
Rutidosis heterogama	Heath Wrinklewort	Vulnerable	This species grows in heath on sandy soils and moist areas in open forest and has been recorded along disturbed roadsides. This species has been recorded from near Cessnock to Kurri Kurri with an outlying occurrence at Howes Valley. The species is associated with PCTs present within the subject land (PCT1589, 1590 and 1619). Suitable habitat occurs within the subject land in the form of heathy vegetation on sandy soils, as well as a small area of moist areas in open forest. A total of 20 records exist within the locality as defined on the OEH BioNet Atlas using a 10 km search.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
			Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	
Syzygium paniculatum	Magenta Lilly Pilly	Vulnerable	The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the central coast Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. The site contains no suitable habitat or associated PCTs. There are a total of six records as defined on the OEH BioNet Atlas 10 km search. No rainforest communities are present within the subject land, therefore the species is unlikely to occur on the site.	Unlikely
Tetratheca juncea	Black-eyed Susan	Vulnerable	Locally this species is usually found in low open forest/woodland with an undisturbed mixed shrubby understorey and grassy groundcover often in association with the Awaba Soil Landscape. It generally prefers well-drained sites below 200m elevation and annual rainfall between 1000 - 1200mm. The preferred substrates are sandy skeletal soil on sandstone, sandy-loam soils, low nutrients; and clayey soil from conglomerates, pH neutral. While some studies show the species has a preference for cooler southerly aspects, it has been found on slopes with a variety of aspects. Suitable habitat exists within the subject land in the form of open forest with a native grassy groundcover. The PCT 1619 Smooth-barked Apple – Red Bloodwood – Brown Stringybark – Hairpin Banksia found within the subject land is very commonly associated with this threatened species. However, the site does not face the preferred south easterly aspect. >3000 records exist as defined by the OEH Bionet 10 km search. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	Unlikely

Scientific Name	Common Name	Status	Habitat Requirement	Habitat Present
Thesium australe	Austral Toadflax	Vulnerable	Austral Toadflax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Although originally described from material collected in the SW Sydney area, populations have not been seen in a long time. It may persist in some areas in the broader region. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. The species is associated with PCTs present within the subject land (PCT1589 and 1619). Suitable habitat exists within the study area in the form of an open forest with grassy understory. No records exist within the OEH Bionet 10km search area. Surveys were undertaken in accordance with the BAM 2020, no individuals were identified during the survey. Therefore, the species is unlikely to be present within the site.	Unlikely

Migratory Terrestrial Birds				
Cuculus optatus	Oriental Cuckoo, Horsfield's Cuckoo		This species migrates to the north and east coasts of Australia during the non-breeding season over winter. Mainly inhabiting forests, the Oriental cuckoo occurs in mixed, deciduous, and coniferous forest. It is present at all levels of the forest canopy, and can be found at a range of elevations, occasionally being recorded in mountains as high up as 1,100 m. Broadly, suitable habitat is present within the site for this species. 10 Bionet records of the species exist within 10 km of the site, all occurring approximately 8.5 km north east of the site within close proximity to the Hunter River. It is unlikely the species occurs within the site.	Unlikely
Hirundapus caudacutus	White-throated Needletail	Vulnerable	The White-throated Needletail is widespread in across the coast of eastern and south-eastern Australia, and Tasmania. White-throated Needletails only occur as vagrants in the Northern Territory and in Western Australia. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1m up to more than 1000m above the ground. Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable (Cramp 1985), but there are, nevertheless, certain preferences exhibited by the species. They are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. The species is associated with PCTs present within the site (1589 and 1590). Suitable habitat is present in the form of open forests. A total of 95 Bionet records of the species exist within 10 km of the subject land boundary. The species is predominantly aerial; however, the subject land serves as potential habitat for the species.	**Likely**
Monarcha melanopsis	Black-faced Monarch		The Black-faced Monarch is widespread in eastern Australia. In Queensland, it is widespread from the islands of the Torres Strait and on Cape York Peninsula, south along the coasts (occasionally including offshore islands) and the eastern slopes of the Great Divide, to the New South Wales border. In New South Wales and the Australian Capital Territory, the species occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park, Wombeyan Caves and Canberra. The Black-faced Monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	Unlikely

			No suitable habitat present within the site as there are no rainforest ecosystems present. There are no Bionet records of the species occur within 10 km of the site. It is unlikely the species occurs within the site.	
Motacilla flava	Yellow Wagtail		Occurs throughout Australia. Can be found in a range of land uses including pastures, wetlands, shrublands, grasslands and man-made environments. The yellow wagtail typically forages in damp grassland and on relatively bare open ground at edges of rivers, lakes and wetlands, but also feeds in dry grassland and in fields of cereal crops. No suitable habitat present within the site. No bare open ground present near waterbodies occurs within the site. 35 Bionet records of the species occur within 10 km of the site, with the closest record occurring approximately 5 km north east of the site. It is unlikely the species occurs within the site.	Unlikely
Myiagra cyanoleuca	Satin Flycatcher		The Satin Flycatcher is widespread in eastern Australia and vagrant to New Zealand (Blakers et al. 1984; Coates 1990a). In Queensland, it is widespread but scattered in the east, being recorded on passage on a few islands in the western Torres Strait. Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Satin Flycatchers mainly inhabit eucalypt forests, often near wetlands or watercourses. They generally occur in moister, taller forests than the Leaden Flycatcher, *Myiagra rubecula*, often occurring in gullies. They also occur in eucalypt woodlands with open understorey and grass ground cover and are generally absent from rainforest. Broadly, suitable habitat is present within the site in the form of eucalypt woodlands with open understorey. However, No Bionet records of the species occur within 10 km of the site. It is unlikely the species occurs within the site.	Unlikely

Rhipidura rufifrons	Rufous Fantail		The Rufous Fantail occurs in coastal and near coastal districts of northern and eastern Australia. In east and south-east Australia, the Rufous Fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as Tallow-wood (*Eucalyptus microcorys*), Mountain Grey Gum (*E. cypellocarpa*), Narrow-leaved Peppermint (*E. radiata*), Mountain Ash (*E. regnans*), Alpine Ash (*E. delegatensis*), Blackbutt (*E. pilularis*) or Red Mahogany (*E. resinifera*); usually with a dense shrubby understorey often including ferns. They also occur in subtropical and temperate rainforests; for example near Bega in south-east NSW, where they are recorded in temperate Lilly Pilly (*Acmena smithi*) rainforest, with Grey Myrtle (*Backhousia myrtifolia*), Sassafras (*Doryphora sassafras*) and Sweet Pittosporum (*Pittosporum undulatum*) subdominants. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, including Spotted Gum (*Eucalyptus maculata*), Yellow Box (*E. melliodora*), Ironbarks or Stringybarks, often with a shrubby or heath understorey. They are also recorded from parks and gardens when on passage. In north and north-east Australia, they often occur in tropical rainforest and monsoon rainforests, including semi-evergreen mesophyll vine forests, semi-deciduous vine thickets or thickets of Paperbarks (*Melaleuca spp.*) (Higgins et al. 2006). Marginal habitat occurs for the species when on passage, however is generally restricted to wet sclerophyll and rainforests. No Bionet records of the species occur within 10 km of the site. Therefore, it is unlikely the species occurs within the site.	Unlikely
Symposiachrus trivirgatus	Spectacled Monarch		This species occurs around the coast of NSW. The Spectacled Monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves. No suitable habitat present within the site. The subject land contains thick understory of *Lantana camara*, however no rainforest formations or mangrove communities are present within the site. No Bionet records of the species occur within 10 km of the site. It is unlikely the species occurs within the site.	Unlikely
Migratory Wetland Birds				

Actitis hypoleucos	Common Sandpiper		The Common Sandpiper is found along all coastlines of Australia and in many areas inland. The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The Common Sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties. The muddy margins utilised by the species are often narrow, and may be steep. The species is often associated with mangroves, and sometimes found in areas of mud littered with rocks or snags. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 19 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Arenaria interpres	Ruddy Turnstone		The Ruddy Turnstone is widespread within Australia during its non-breeding period of the year. It is mainly found on coastal regions with exposed rock coast lines or coral reefs. This species arrives in east Australia from September. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). Six Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Calidris acuminata	Sharp-tailed Sandpiper		The Sharp-tailed Sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. Most of the population migrates to Australia, mostly to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. Many inland records are of birds on passage. In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs.	Unlikely

			No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 570 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	
Calidris canutus	Red Knot, Knot	Endangered	The Red Knot is common in all the main suitable habitats around the coast of Australia. They mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They move south, mostly along coasts, with some inland records from September–November and arrive in south-west Australia from September. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). There are 24 records within a 10 km Bionet search. It is unlikely that the species occurs within the subject land.	Unlikely
Calidris ferruginea	Curlew Sandpiper	Critically Endangered	In Australia, Curlew Sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. There are 141 records of the species within a 10 km Bionet search. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	Unlikely

Calidris melanotos	Pectoral Sandpiper		The Pectoral Sandpiper is widespread, but scattered. Records exist east of the Great Divide, from Casino and Ballina, south to Ulladulla. West of the Great Divide, the species is widespread in the Riverina and Lower Western regions. In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 13 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Calidris ruficollis	Red-necked Stint		It is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. The Red-necked Stint has been recorded in all coastal regions, and found inland in all states when conditions are suitable. In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in saltflats. They sometimes use flooded paddocks or damp grasslands. They have occasionally been recorded on dry gibber plains, with little or no perennial vegetation. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 186 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Calidris tenuirostris	Great Knot	Critically Endangered	The Great Knot has been recorded in Narooma, Tullakool, Armidale, Gilgandra and Griffith. Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Often recorded on sandy beaches with mudflats nearby, sandy spits and islets and sometimes on exposed reefs or rock platforms. Migrates to Australia from late August to early September, although juveniles may not arrive until October-November. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 9 records exist within a 10 km Bionet search. It is unlikely that the species occurs within the site.	Unlikely

Charadrius bicinctus	Double-banded Plover		The Double-banded Plover can be found in both coastal and inland areas. During the non-breeding season, it is common in eastern and southern Australia, mainly between the Tropic of Capricorn and western Eyre Peninsula. The Double-banded Plover is found on littoral, estuarine and fresh or saline terrestrial wetlands and also saltmarsh, grasslands and pasture. It occurs on muddy, sandy, shingled or sometimes rocky beaches, bays and inlets, harbours and margins of fresh or saline terrestrial wetlands such as lakes, lagoons and swamps, shallow estuaries and rivers. The species is sometimes associated with coastal lagoons, inland salt lakes and saltworks. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). No Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Charadrius leschenaultii	Greater Sand Plover, Large Sand Plover	Vulnerable	In Australia, the Greater Sand Plover occurs in coastal areas in all states. n the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons, and inshore reefs, rock platforms, small rocky islands or sand cays on coral reefs. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). No Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Charadrius mongolus	Lesser Sand Plover, Mongolian Plover	Endangered	The Lesser Sand Plover breeds in central and north eastern Asia, migrating further south for winter. Occurs almost entirely coastal in NSW, favouring the beaches of sheltered bays, harbours and estuaries with large intertidal sandflats or mudflats; occasionally occurs on sandy beaches, coral reefs and rock platforms. Roosts during high tide on sandy beaches, spits and rocky shores; forage individually or in scattered flocks on wet ground at low tide, usually away from the water's edge. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 7 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely

Gallinago hardwickii	Latham's Snipe, Japanese Snipe		Latham's Snipe is a non-breeding visitor to south-eastern Australia, and is a passage migrant through northern Australia. The species has been recorded along the east coast of Australia from Cape York Peninsula through to south-eastern South Australia. In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity. The structure and composition of the vegetation that occurs around these wetlands is not important in determining the suitability of habitat (Naarding 1983). The species is chiefly a wetland species, inhabiting ephemeral or permanent wetlands. The species may also occur in a variety of ephemeral and permanent waterbodies, however must contain features suitable for foraging including grasses, sedges and rushes, or mudflats. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 381 Bionet records occur within 10 km of the site, including a record from 2008 within the boundaries of the site. The siting does not specify whether the observation was a fly-over or interacting with the subject land. The site does not contain ephemeral or permanent wetlands. The site contains a single permanent waterbody, however does not contain a suitable bank suitable for wading. Additionally, an ephemeral stream and several small ephemeral waterbodies are present within the site, only observed to hold water in periods of extensive rain. The subject land does not fit the criteria as typical habitat for the species and it is likely that the Bionet record was sighted on flight to the Hunter Wetland complex just north of the site. Nonetheless, owing to the record on site, there is potential for the species to occur within the subject land.	**Likely**
Gallinago megala	Swinhoe's Snipe		Swinhoe's Snipe occurs along the coast of Australia during the non-breeding season. During the non-breeding season Swinhoe's Snipe occurs at the edges of wetlands, such as wet paddy fields, swamps and freshwater streams. The species is also known to occur in grasslands, drier cultivated areas (including crops of rapeseed and wheat) and market gardens. Habitat specific to Australia includes the dense clumps of grass and rushes round the edges of fresh and brackish wetlands. This includes swamps, billabongs, river pools, small streams and sewage ponds. They are also found in drying claypans and inundated plains pitted with crab holes. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). No Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely

Gallinago stenura	Pin-tailed Snipe		The Pin-tailed Snipe's distribution within Australia is not well understood, in NSW a single banded bird was reported near West Wyalong. During non-breeding period in Australia, the Pin-tailed Snipe occurs most often in or at the edges of shallow freshwater swamps, ponds and lakes with emergent, sparse to dense cover of grass/sedge or other vegetation. The species is also found in drier, more open wetlands such as claypans in more arid parts of species' range. It is also commonly seen at sewage ponds; not normally in saline or inter-tidal wetlands. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). No Bionet records occur within 10km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Limicola falcinellus	Broad-billed Sandpiper		Broad-billed Sandpiper breeds in northern Siberia before migrating southwards in winter to Australia. In NSW, the main site for the species is the Hunter River estuary, with birds occasionally reaching the Shoalhaven estuary. There are few records for inland NSW. Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 3 Bionet records occur within 10km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Limosa lapponica	Bar-tailed Godwit	Vulnerable	The Bar-tailed Godwit has been recorded in the coastal areas of all Australian states. The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks and airstrips, although it is commonly recorded in paddocks at some locations overseas. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 68 Bionet records occur within 10km of the site. It is unlikely that the species occurs within the subject land.	Unlikely

Limosa limosa	Black-tailed Godwit		The Black-tailed Godwit is found in all states and territories of Australia, however, it prefers coastal regions and the largest populations are found on the north coast between Darwin and Weipa. In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use lagoons in sewage farms and saltworks. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 57 Bionet records occur within 10km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Numenius madagascariensis	Eastern Curlew, Far Eastern Curlew	Critically Endangered	Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states and rarely inland. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms. The species is not associated with any PCTs present within the subject land. A total of 23 Bionet records of the species exist within 10km of the subject land boundary. It is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). It is unlikely that the species occurs within the site.	Unlikely
Numenius minutus	Little Curlew, Little Whimbrel		Little Curlews generally spend the non-breeding season in northern Australia from Port Hedland in Western Australia to the Queensland coast (Minton 2002 pers. comm.). There are records of the species from inland Australia, and widespread but scattered records on the east coast. The species has also been recorded on Lord Howe Island, Cocos-Keeling Island and Christmas Island. When resting during the heat of day, the Little Curlew congregates around pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs. The species prefers pools with bare dry mud (including mudbanks in shallow water) and they do not use pools if they are totally dry, flooded or heavily vegetated (Higgins & Davies 1996).	Unlikely

			No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). A single Bionet record occurs within 10km of the site. It is unlikely that the species occurs within the subject land.	
Numenius phaeopus	Whimbrel		The Whimbrel is a regular migrant to Australia and New Zealand, with a primarily coastal distribution. There are also scattered inland records of Whimbrels in all regions. It is found in all states but is more common in the north. The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields. There are a small number of inland records from saline lakes and canegrass swamps. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 35 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Pandion cristatus (Formerly *Pandion haliaetus)*	Eastern Osprey		The breeding range of the Eastern Osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in NSW; with a second isolated breeding population on the coast of South Australia, extending from Head of Bight east to Cape Spencer and Kangaroo Island. Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. No suitable habitat occurs within the subject land as the site does not contain extensive areas of open fresh water for foraging. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 66 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely

Philomachus pugnax	Ruff (Reeve)		In Australia the Ruff is found on generally fresh, brackish of saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. They are occasionally seen on sheltered coasts, in harbours, estuaries, seashores and are known to visit sewage farms and saltworks. They are sometimes found on wetlands surrounded by dense vegetation including grass, sedges, saltmarsh and reeds. They have been observed on sand spits and other sandy habitats including shingles. The Ruff forages on exposed mudflats, in shallow water and occasionally on dry mud. They have been observed foraging in dry waterside plants and in swampy areas next to aeration tanks in sewage farms. They prefer to roost amongst shorter vegetation Most NSW records come from the Sydney region. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). Six Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Pluvialis fulva	Pacific Golden Plover		Within Australia, the Eastern Curlew has a primarily coastal distribution. The species is found in all states and rarely inland. The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves. The birds are also found in saltworks and sewage farms. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 139 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Pluvialis squatarola	Grey Plover		The Grey Plover has been recorded in all states, where it is found along the coasts. In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons. The species is also very occasionally recorded further inland, where they occur around wetlands or salt-lakes. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). Six Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely

Tringa brevipes	Grey-tailed Tattler		In NSW the Grey-tailed Tattler is distributed along most of the coast from the Queensland border, south to Tilba Lake. It is more heavily distributed along coastal regions north of Sydney. It is often found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. The Grey-tailed Tattler arrives in Australia mostly in August, however, they sometimes appear south of the breeding range as early as July. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 39 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Tringa nebularia	Common Greenshank, Greenshank		The Common Greenshank does not breed in Australia, however, the species occurs in all types of wetlands across Australia. The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. The species is known to forage at edges of wetlands, in soft mud on mudflats, in channels, or in shallows around the edges of water often among pneumatophores of mangroves or other sparse, emergent or fringing vegetation, such as sedges or saltmarsh. It will occasionally feed on exposed seagrass beds. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 371 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Tringa stagnatilis	Marsh Sandpiper, Little Greenshank		The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia. The species is widespread in coastal Queensland, but few records exist north of Cooktown. It is recorded in all regions of NSW but especially the central and south coasts and (inland) on the western slopes of Great Divide and western plains. The Marsh Sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. No suitable habitat occurs within the subject land. A single waterbody is present within the subject land, however contains limited suitable foraging habitat. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). 262 Bionet records occur within 10 km of the site. It is unlikely that the species occurs within the subject land.	Unlikely

Xenus cinereus	Terek Sandpiper		The Terek Sandpiper is a rare migrant to the eastern and southern Australian coasts, being most common in northern Australia. The two main sites for the species in NSW are the Richmond River estuary and the Hunter River estuary. The latter has been identified as nationally and internationally important for the species. In Australia, has been recorded on coastal mudflats, lagoons, creeks and estuaries. Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Generally roosts communally amongst mangroves or dead trees, often with related wader species. No suitable habitat occurs within the subject land. The site is located ~300 m south of BOAMS mapped Migratory Shorebird Important Area (Hunter Estuary). A total of 33 Bionet records occur within 10km of the site. It is unlikely that the species occurs within the subject land.	Unlikely
Migratory Marine Birds				
Apus pacificus	Fork-tailed Swift		In NSW, the Fork-tailed Swift is recorded in all regions. Many records occur east of the Great Divide; however, a few populations have been found west of the Great Divide. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines. Marginal suitable habitat occurs within the subject land. 19 Bionet records occur within 10 km of the site. However, due to the size of the site and the species ecology being predominately aerial the species is unlikely to inhabit the subject land.	Unlikely

Appendix H EPBC Act Assessment of Significance

EPBC Listed Endangered and Critically Endangered Species

Regent Honeyeater	
Significant Impact Guideline	Assessment
Lead to a long-term decrease in the size of an important population of a species	No mapped Important Area for the species exists within the subject land. Approximately 11.51 ha of potential habitat exists within the subject land in the form of vegetation communities PCT 1589 and 1590. Canopy species *Corymbia maculata, Eucalyptus fibrosa* and a number of stringybark species present within the subject land are known feed trees within the region. Approximately 670 ha of vegetation within the 1500 m study area is identified as suitable habitat for the species. Suitable habitat within the subject land represents 1.8% of available habitat within the locality. Furthermore, approximately 15000 ha of suitable habitat exists within a 10 km radius of the subject land, potential habitat to be impacted for the species is <0.1% of the available habitat. Therefore, it is unlikely the proposal will lead to the long-term decrease of an important population.
Reduce the area of occupancy of the species	No. The subject land is unlikely an reduce the occupancy of the species (see above).
Fragment an existing important population into two or more populations	No. The proposal will not create new points of fragmentation of areas identified as important habitat for the species. The proposal will fragment and decrease a larger continuous patch of vegetation by 12.45 ha. Connectivity will be retained through the establishment of a 11.52 ha C2 corridor within the core of the site. Additionally, the proposal will see to expand the extent of C2 land within the very south of the lot, increasing the amount of C2 land within the larger patch of vegetation. The fragmentation of foraging habitat will not largely impact dispersal or movement for the highly mobile species.
Adversely affect habitat critical to the survival of a species	The proposal will impact 11.51 ha of area identified as potential habitat. The subject land is not mapped as Important Area for the species. Important Mapped Areas indicated habitat critical to upholding the survival of the species. Therefore, it is unlikely the removal of this potential habitat will adversely affect the survival of the species.
Disrupt the breeding cycle of an important population	No known breeding sites are in close proximity to the subject land. Both known breeding sites within NSW are west of the Divide. Therefore, the proposal is not likely to disrupt the breeding cycle of an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will impact 11.51 ha of area identified as potential habitat for the species, this represents ~1.8% of identified potential habitat within the 1500 m study area and <0.1% of available habitat within 10 km of the subject land. No important mapped areas for the species are located within the subject land. The proposal will not modify, destroy, remove isolate, or decrease habitat to the extent that the species is likely to decline at a regional scale or local.

Regent Honeyeater	
Significant Impact Guideline	Assessment
Result in invasive species that are harmful to an endangered or critically endangered species becoming established in the endangered or critically endangered' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), feral cows (*Bos taurus*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*) and wild dogs (*Canis lupus*). The proposal is unlikely to alter the potential for impacts from these species.
Introduce disease that may cause the species to decline, or	The proposal is not at risk of introducing disease. Mitigation and management of impacts (**Section 12**) strategies to avoid contamination risks.
Interfere with the recovery of the species.	The recovery plan identified Habitat Loss and Fragmentation and Habitat Degradation as key threats to the persistence of the species. While the proposal is contributing to 11.51 ha of habitat loss for the species, the scale of the proposed vegetation clearing is unlikely to interfere with the recovery of the species.
Conclusion	Non-significant impact

Spotted-Tail Quoll	
Significant Impact Guideline	Assessment
Lead to a long-term decrease in the size of an important population of a species	Approximately 12.45 ha of potential habitat exists within the subject land. This is in the form of vegetation communities PCT 1589, 1590 and 1619, containing a formation in a moderate to disturbed state with a mostly intact mature canopy and habitat features suitable for the species. Approximately 680 ha of vegetation of suitable open forest and woodland exists within the 1500 m study area, the subject land represents 1.9% of the available habitat available within this area. Suitable habitat within the subject land represents 1.8% of available habitat within the locality. Furthermore, approximately 15000 ha of suitable habitat exists within a 10 km radius of the subject land, potential habitat to be impacted for the species is <0.1% of the available habitat. Therefore, it is unlikely the proposal will lead to the long-term decrease of an important population.
Reduce the area of occupancy of the species	No. The subject land is unlikely an reduce the occupancy of the species (see above).
Fragment an existing important population into two or more populations	No. The proposal will not create new points of fragmentation of areas identified as important habitat for the species. The proposal will fragment and decrease a larger continuous patch of vegetation by 12.45 ha. Connectivity will be retained through the establishment of a 11.52 ha C2 corridor within the core of the site. Additionally, the proposal will see to expand the extent of C2 land within the very south of the lot, increasing the amount of C2 land within the larger patch of vegetation. The fragmentation of foraging habitat will not largely impact dispersal or movement for the highly mobile species.
Adversely affect habitat critical to the survival of a species	The proposal will impact up to 12.45 ha of potential foraging habitat for the species, this represents 1.9% of available habitat within the 1500 m study area and <0.1% of available habitat within 10 km of the subject land. No signs of the species or breeding habitat was detected during extensive targeted surveys. Therefore, it is unlikely the removal of 12.45 ha of potential habitat will adversely affect the survival of the species.
Disrupt the breeding cycle of an important population	No. No signs of the species or breeding habitat was detected during extensive targeted surveys. No burrows or dens were observed within the subject land. Therefore, the subject land is unlikely an important population.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will impact 12.45 ha of area identified as potential habitat for the species, this represents ~1.9% of identified potential habitat within the 1500m study area and <0.1% of available habitat within 10 km of the subject land. No important mapped areas for the species are located within the subject land. The proposal will not modify, destroy, remove isolate, or decrease habitat to the extent that the species is likely to decline at a regional scale or local.

Spotted-Tail Quoll	
Significant Impact Guideline	Assessment
Result in invasive species that are harmful to a endangered or critically endangered species becoming established in the endangered or critically endangered' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), feral cows (*Bos taurus*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*) and wild dogs (*Canis lupus*). The proposal is unlikely to alter the potential for impacts from these species.
Introduce disease that may cause the species to decline, or	The proposal is not at risk of introducing disease. Mitigation and management of impacts (**Section 12**) strategies to avoid contamination risks.
Interfere with the recovery of the species.	The recovery plan takes focus on understanding the biology and ecology of the Spotted-tailed Quoll, and reducing impacts from exotic species and human activities. While the proposal is contributing to 12.45 ha of habitat loss, the species was not detected during the extensive surveys across the site. Therefore, the site is unlikely to serve as important habitat for the species and is unlikely to interfere with the recovery of the species.
Conclusion	Non-significant impact

Swift Parrot	
Significant Impact Guideline	Assessment
Lead to a long-term decrease in the size of an important population of a species	No mapped Important Area for the species exists within the subject land. Approximately 12.45 ha of potential habitat exists within the subject land in the form of vegetation communities PCT 1589, 1590 and 1619. Canopy species *Corymbia maculata, Eucalyptus fibrosa* and *Corymbia gummifera* are species present within the subject land are favoured feed trees within the region. Approximately 515 ha of vegetation within the 1500 m study area is identified as suitable habitat for the species. Suitable habitat within the subject land represents 2.5% of available habitat within the locality. Furthermore, approximately 15000 ha of suitable habitat exists within a 10 km radius of the subject land, potential habitat to be impacted for the species is <0.1% of the available habitat. Therefore, it is unlikely the proposal will lead to the long-term decrease of an important population.
Reduce the area of occupancy of the species	No. The subject land is unlikely an reduce the occupancy of the species (see above).
Fragment an existing important population into two or more populations	No. The proposal will not create new points of fragmentation of areas identified as important habitat for the species. The proposal will fragment and decrease a larger continuous patch of vegetation by 12.45 ha. Connectivity will be retained through the establishment of a 11.52 ha C2 corridor within the core of the site. Additionally, the proposal will see to expand the extent of C2 land within the very south of the lot, increasing the amount of C2 land within the larger patch of vegetation. The fragmentation of foraging habitat will not largely impact dispersal or movement for the highly mobile species.
Adversely affect habitat critical to the survival of a species	The proposal will impact 12.45 ha of area identified as potential habitat. The subject land is not mapped as Important Area for the species. Important Mapped Areas indicated habitat critical to upholding the survival of the species. Therefore, it is unlikely the removal of 12.45 ha of potential habitat will adversely affect the survival of the species.
Disrupt the breeding cycle of an important population	The species dose not breed on mainland Australia.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will impact 12.45 ha of area identified as potential habitat for the species, this represents ~2.5% of identified potential habitat within the 1500m study area and <0.1% of available habitat within 10 km of the subject land. No important mapped areas for the species are located within the subject land. The proposal will not modify, destroy, remove isolate, or decrease habitat to the extent that the species is likely to decline at a regional scale or local.
Result in invasive species that are harmful to an endangered or critically endangered species becoming established in the endangered or critically endangered' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), feral cows (*Bos taurus*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*) and wild dogs (*Canis lupus*). The proposal is unlikely to alter the potential for impacts from these species.

Swift Parrot	
Significant Impact Guideline	Assessment
Introduce disease that may cause the species to decline, or	Machinery used on site can potentially act as a transport for biosecurity risks. Psittacine beak and feather disease (PBFD) has the potential to impact the species due to the known limited genetic estimates of the functional population, however the proposal is unlikely to exacerbate this threatening process. Environmental safeguards for the management of biosecurity risks will be implemented to reduce these risks to a low level (see **Section 12**).
Interfere with the recovery of the species.	Listed threats to the species are loss and alterations to foraging and nesting habitat (within both Tasmania and Mainland Australia), primarily through land clearing and practises such as forestry, developments, prevention of regeneration and alterations to fire regimes. Also noted impacts are from collisions associated with cars, and competition from other winter foragers aggressive honeyeater species. Psittacine beak and feather disease (PBFD) has the potential to impact the species due to the known limited genetic estimates of the functional population. While the proposal is contributing to 12.45 ha of habitat loss, the species was not detected during the extensive surveys across the site. Therefore, the site is unlikely to serve as important habitat for the species and is unlikely to interfere with the recovery of the species.
Conclusion	Non-significant impact

EPBC Listed Vulnerable Species

White-throated Needletail	
Significant Impact Guideline	Assessment
Lead to a long-term decrease in the size of an important population of a species	Approximately 12.45 ha of potential habitat exists within the subject land. This is in the form of vegetation communities PCT 1589, 1590 and 1619, containing a formation in a moderate to disturbed state with a mostly intact mature canopy and habitat features suitable for the species. Approximately 680 ha of vegetation of comparable habitat exists within the 1500 m study area, the subject land represents 1.9% of the available habitat available within this area. Furthermore, approximately 15000 ha of suitable habitat exists within a 10 km radius of the subject land, potential habitat to be impacted for the species is <0.1% of the available habitat. Additionally, the nearly exclusively aerial species uses exotic vegetation, including lawns and gardens that will be a component of the proposed low residential land, when interacting with terrestrial habitats. Therefore, it is unlikely the proposal will lead to the long-term decrease of an important population.
Reduce the area of occupancy of an important population	No. The subject land is unlikely an important population (see above).
Fragment an existing important population into two or more populations	No. The proposal will not create new points of fragmentation of areas identified as important habitat for the species. The proposal will fragment and decrease a larger continuous patch of vegetation by 12.45 ha. Connectivity will be retained through the establishment of a 11.52 ha C2 corridor within the core of the site. Additionally, the proposal will see to expand the extent of C2 land within the very south of the lot, increasing the amount of C2 land within the larger patch of vegetation. The fragmentation of foraging habitat will not largely impact dispersal or movement for the mobile species.
Adversely affect habitat critical to the survival of a species	The proposal will impact up to 12.45 ha of potential foraging habitat for the species, this represents 1.9% of available habitat within the 1500 m study area and <0.1% of available habitat within 10 km of the subject land. No signs of the species or breeding habitat was detected during extensive targeted surveys. Therefore, it is unlikely the removal of 12.45 ha of potential habitat will adversely affect the survival of the species.
Disrupt the breeding cycle of an important population	No. The subject land is unlikely an important population (see above and **Section 5.3**). Additionally, the species exclusively occupies Australia for foraging.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will impact 12.45 ha of area identified as potential habitat for the species, this represents ~1.9% of identified potential habitat within the 1500m study area and <0.1% of available habitat within 10 km of the subject land. No important mapped areas for the species are located within the subject land. The proposal will not modify, destroy, remove isolate, or decrease habitat to the extent that the species is likely to decline at a regional scale or local.

White-throated Needletail	
Significant Impact Guideline	Assessment
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), feral cows (*Bos taurus*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*) and wild dogs (*Canis lupus*). The proposal is unlikely to alter the potential for impacts from these species.
Interfere with the recovery of the species.	Key threats for the species include collision with turbines and other large anthropogenic structures, and the use of insecticides. The proposal does not anticipate to exacerbate key threats, therefore the proposal is unlikely to interfere with the recovery of the species.
Conclusion	Non-significant impact

EPBC Listed Migratory Species

Latham's Snipe	
Significant Impact Guideline	Assessment
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	The proposal will impact up to 12.45 ha of native vegetation and 0.65 ha of exotic vegetation/not vegetated areas serving as potential habitat for the species. Habitat within the subject land is not typical for the species, no wetlands or suitable waterbodies for foraging are present within the site. However, a OEH Bionet record from 2008 is located within the site boundary. If indeed the species interacted with vegetation contained within the subject land, it was likely on transit to more suitable habitat, likely the Hunter Wetland complex just north of the site. Available superior habitat in the form of the Hunter Wetland Complex makes up a large portion of native vegetation within the locality. Therefore, it is unlikely the proposal will destroy or isolate an area of important habitat for the species.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or	The subject land is likely already habitat for a range of pest species, including foxes (*Vulpes vulpes*), feral cows (*Bos taurus*), rabbits (*Oryctolagus cuniculus*), cats (*Felis catus*) and wild dogs (*Canis lupus*). The proposal is unlikely to alter the potential for impacts from these species.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	The proposal will impact up to 12.45 ha of native vegetation and 0.65 ha of exotic vegetation/not vegetated areas serving as potential habitat for the species, of which is unlikely to serve as important habitat for a population (see above). Therefore, it is unlikely that the proposal will disrupt the lifecycle of the species.
Conclusion	Non-significant impact

Appendix I Anabat Analysis Report

Identification of echolocation call sequences recorded at Fletcher, New South Wales.

Data

Data was received by Dropbox© on the 28th November 2019 and was analysed using Anabat Insight 1.9.0v. Data was received from two detectors, recorded over twenty-five nights from the 13th – 23rd November 2019 and the 13th – 26th November 2019 respectively. In total 6,939 files were received. Location was provided as an address as log files were not received with the data set. Calls were recorded with a division ratio of 8. The original call files display Australian Eastern Standard Time.

Reference Library

Call identification for this data set was based on call keys and descriptions for New South Wales (Pennay et al 2004) with reference to descriptions published for southern Queensland (Reinhold et al 2001), and the authors own reference calls.

Analysis

The reliability of identification is as follows;

Definite; one or more calls were there is no doubt about the identification of the species

Probable; most likely to be the species named, low probability of confusion with species that use similar calls

Possible; call is comparable with the named species, with a moderate to high probability of confusion with species of similar calls.

A total of twenty species were identified. Nine species; *Austronomus australis*, *Mormopterus ridei, Mormopterus norfolkensis, Chalinolobus gouldii, Scotorepens orion*, *Chalinolobus morio, Vespadelus pumilus, Miniopterus australis* and *Rhinolophus megaphyllus* were identified as definite. Nine species; *Saccolaimus flaviventris, Mormopterus planiceps/Mormopterus ridei, Chalinolobus gouldii /Mormopterus* sp., *Scoteanax rueppellii/ Scotorepens orion/Falsistrellus tasmaniensis, Scoteanax rueppellii/ Scotorepens orion, Myotis macropus/Nyctophilus species, Vespadelus regulus/ Miniopterus orianae oceanensis, Chalinolobus morio/Vespadelus species,* and *Vespadelus vulturnus/Vespadelus pumilus/ Vespadelus troughtoni* were identified as probable. Two species, *Chalinolobus dwyeri* and *Falsistrellus tasmaniensis/Vespadelus darlingtoni* were identified as possible.

While some call sequences were recognised as bat calls the quality was not sufficient to assign species identification. These species have been recorded or are considered likely to occur in the surrounding area (NPWS Atlas and Wildlife of Living Australia Data November 2019).

Please see Table 1. for an outline of species detected per detector.

Table 1 - Anabat recording results per detector

Detector Name	**AB1**	**AB2**
Species name		
Definite		
Austronomus australis	X	X
Saccolaimus flaviventris		*
Chalinolobus dwyeri	#	#
Mormopterus ridei	X	
Mormopterus norfolkensis	X	*
Chalinolobus gouldii	X	X
Scotorepens orion	X	X
Chalinolobus morio	X	X
Vespadelus pumulis	X	X
Miniopterus australis	X	X
Rhinolophus megaphyllus	X	
Species composites/groups identified		
Mormopterus planiceps/M. ridei	*	*
Chalinolobus gouldii / Mormopterus species	*	*
Scoteanax rueppellii/ Scotorepens orion/Falsistrellus tasmaniensis	*	*
Scoteanax rueppellii/ Scotorepens orion	*	*
Myotis macropus/ Nyctophilus species	*	*
Falsistrellus tasmaniensis/Vespadelus darlingtoni	#	
Vespadelus regulus / Miniopterus orianae oceanensis	*	
Chalinolobus morio /Vespadelus species	*	*
Vespadelus vulturnus/Vespadelus pumilus/ Vespadelus troughtoni	*	*

Probability assigned values are discussed in report

X definite

* probable

possible

Call Examples (calls have been edited and filtered for reporting purposes)

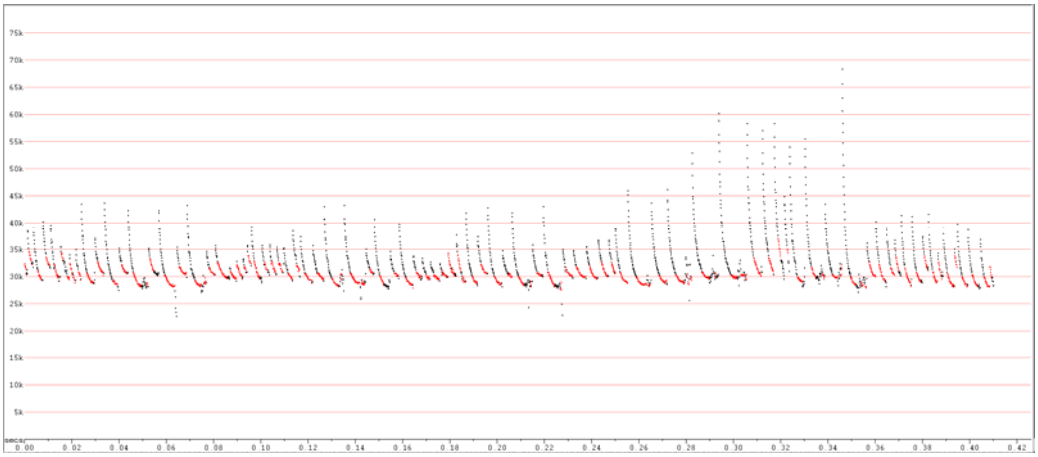
Section 1.

Species positively identified

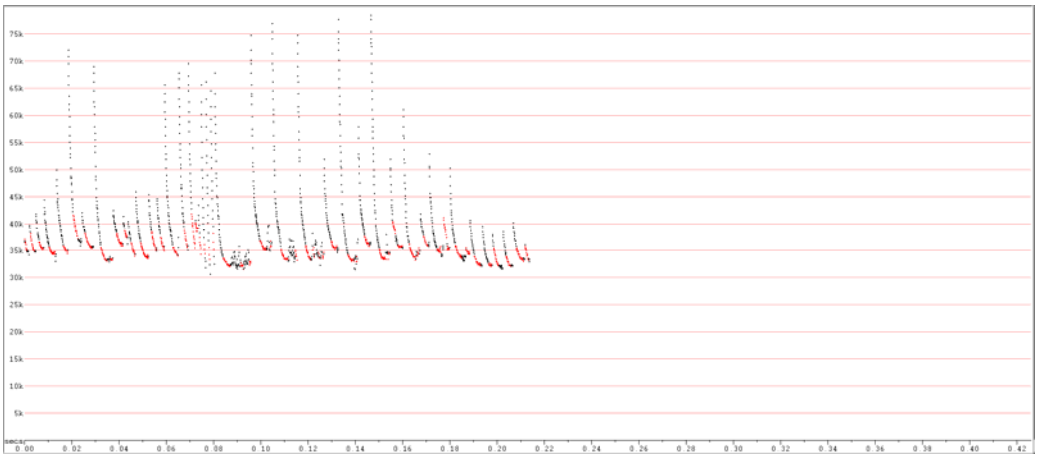
Definitely *Austronomus australis*. The characteristic frequency if this species is between 10 – 15 kHz. This species may be confused with *Saccolaimus flaviventris* at its lower harmonics.

Definitely *Mormopterus ridei*. The species produces flat or shallow-curved pulses with no alternation between approximately 30 – 36 kHz. Attach phase pulses are typically more curved than cruise phase.

Definitely *Mormopterus norfolkensis*. The species calls between 31 – 35 kHz with pulses alternating by approximately 2 kHz while in search phase. The alternation and the pulse shape are characteristic of the species.



Definitely *Chalinolobus gouldii*. The call sequence is curved average characteristic frequency is between 25 and 34 KHz. Consecutive pulses alternate in frequency.

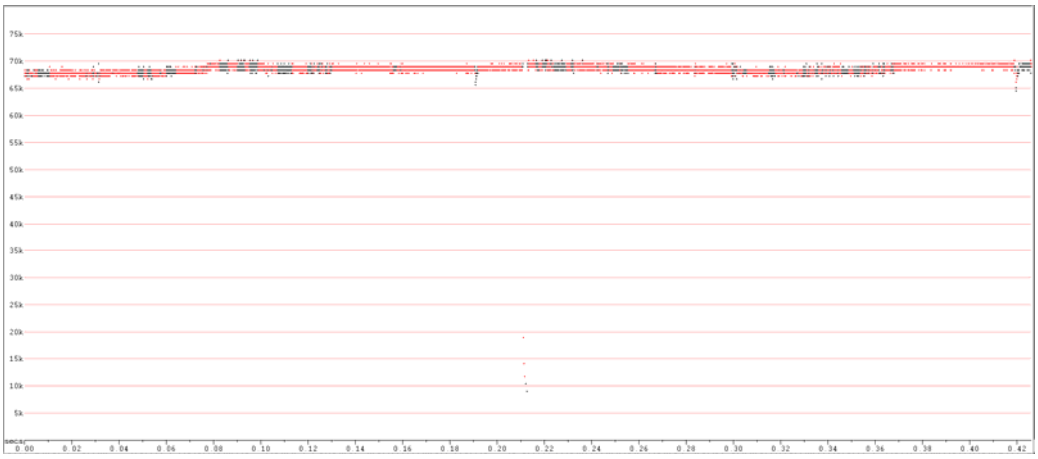


Definitely *Scotorepens orion*. The pre characteristic drop of this calls sequence is 1.74 kHz and the 'hook' at the end of the tail section indicate that the call belongs to the species.

Definitely *Chalinolobus morio*. The species can be distinguished by a down sweeping tail between 49.5 – 52.5 kHz.

Definitely *Vespadelus pumilus*. The end frequency of this call is above 54.5 kHz, distinguishing it from other Vespadelus species calling between 50 – 53.5 kHz.

Definitely *Miniopterus australis*. The species has a curved call between 54.5 – 64.5khz with a down-sweeping tail.



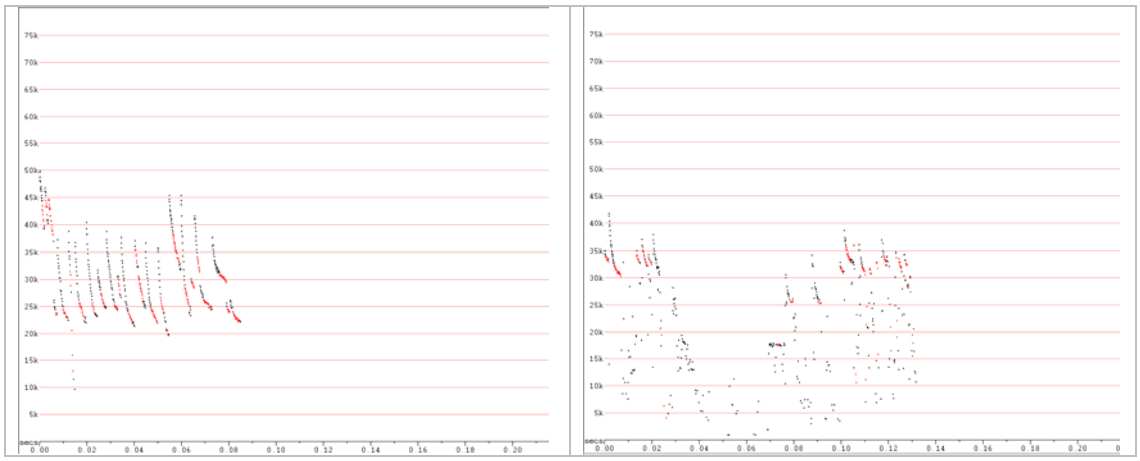
Definitely *Rhinolophus megaphyllus*. The species displays a constant frequency 'flat' call between 66 – 70 kHz.

Section 2.

Species composites/groups identified

A species listed here that is not also listed in the species positively identified should be considered as present. Likelihood of occurrence and call identification issues for these species are discussed below each call example.

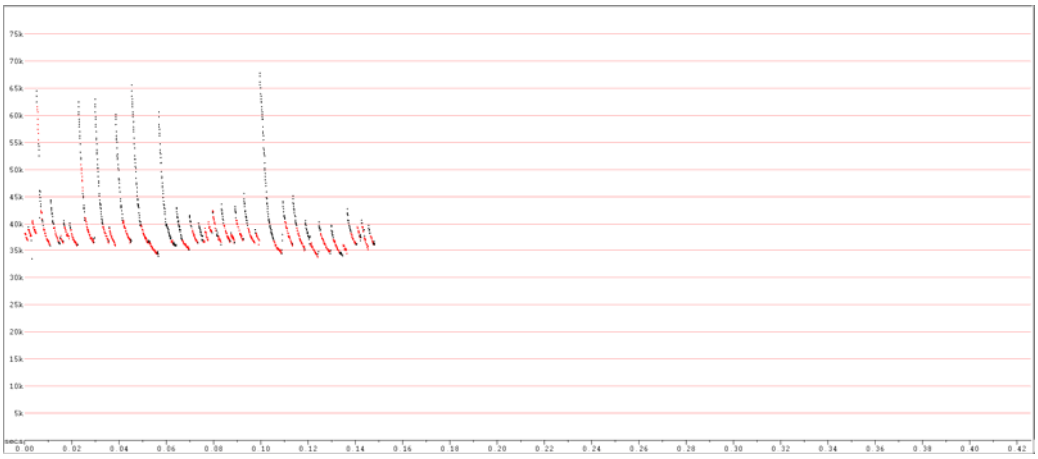
Probably *Saccolaimus flaviventris*. The pulses are a little steep for the species at this frequency as such the call has been marked as probable.



Possibly *Chalinolobus dwyeri*. The species calls between 22 – 23.5 kHz in the Sydney Basin region, with curved pulses alerting in frequency. There is insufficient detail in this call sequence to assign species identification. The pulses could belong to the social calls of *Chalinolobus gouldii* which is present in other parts of this call sequence.

Probably *Mormopterus planiceps/Mormopterus ridei*. Published descriptions of calls for *M. planiceps* species report that it calls between 26 – 30.5 kHz, although it has been recorded lower at around 24 kHz (pers. com. Greg Ford November 2015), and overlaps with *M. ridei* at around 30 kHz. The calls will be flat in the lower ranges and curved at the higher limits, and dependant on activity and environment.

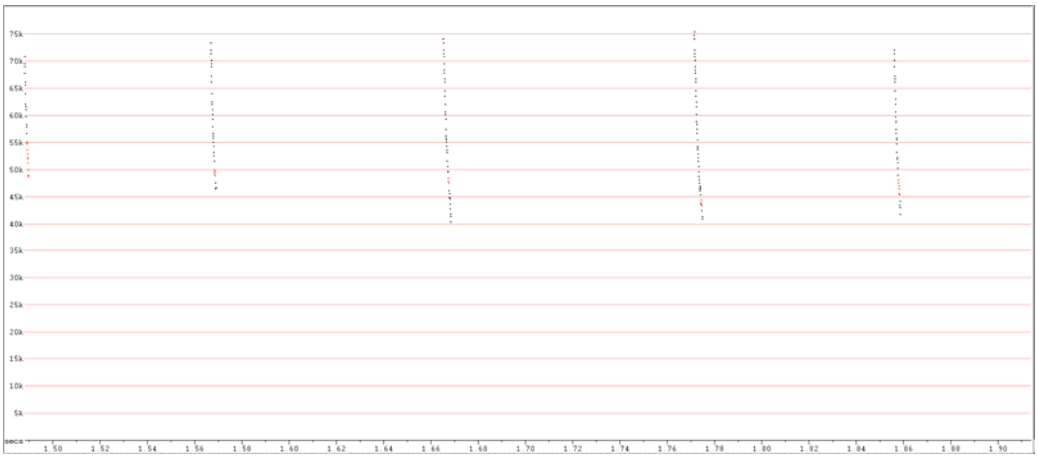
Probably *Chalinolobus gouldii /Mormopterus* sp. Frequency ranges overlap in the species, *C. gouldii* usually has steep, curved pulses that alternate in frequency compared to flat or shallow-curved pulses with no alternation in *Mormopterus* species. The calls could belong to *C. gouldii*, or *M. ridei*.



Probably *Scoteanax rueppellii/ Scotorepens orion/Falsistrellus tasmaniensis*. The pre – characteristic drop of this call sequence is 2.31 kHz with a characteristic frequency of 36.34 kHz (cleaned call). All three species overlap at this frequency and the pre – characteristic drop is too close to 3 kHz to be a reliable metric to separate the species. This is one example of several calls recorded at this frequency within the data set were of insufficient quality to be able to assign positive identification.

Probably *Scoteanax rueppellii/ Scotorepens orion*. The characteristic frequency of this call sequence is 33.81 kHz with a pre characteristic drop of 2.41 kHz. Both species overlap at this frequency and the pre – characteristic drop is too close to 3 kHz to be a reliable metric to separate the species. This is one example of several calls recorded at this frequency within the data set were of insufficient quality to be able to assign positive identification.

Possibly *Falsistrellus tasmaniensis/Vespadelus darlingtoni*. The two species may overlap at approximately 40 kHz when for example flying in clutter. There is insufficient detail in pulse structure to assign positive species identification.



Probably *Myotis macropus/Nyctophilus species*. *M. macropus* calls can be differentiated from Nyctophilus species by having a pulse interval less than 75ms, an initial slope of greater than 400 OPS and often displaying a single change in slope (kink) in the central part of the pulse. This call is uncompressed. There is insufficient detail in the call sequence to separate the species. *Nyctophilus* bats generally produce distinctive calls, however the species within the genus cannot be reliably differentiated from call data. *N. geoffroyi,* N. *gouldi* and *N. corbeni (formerly N. timoriensis* south-eastern form) occur in the area.

Probably *Vespadelus regulus/ Miniopterus orianae oceanensis.* Call characteristics sufficient to separate the species are not evident in some of the call sequences recorded at Fletcher.

Probably *Chalinolobus morio*/*Vespadelus species*. Calls of insufficient pulse structure detail as above were attributed to *C. morio*/*Vespadelus species* where they overlap in frequency around 50 kHz. *Vespadelus vulturnus, V. regulus* and *Vespadelus troughtoni* both exhibit characteristic frequencies that overlap at 50 kHz.

Probably *Vespadelus vulturnus/Vespadelus pumilus/ Vespadelus troughtoni*. The calls of these species overlap between 50.5 – 53 KHz.

References

Churchill, S. (2008) Australian Bats, Allen and Unwin, Sydney.

Bailey, J. (2015) Drayton South Coal Project Environmental Impact Statement. Hansen and Bailey Singleton NSW 2330 for Anglo American Coal Pty Ltd Brisbane QLD 4000.

Pennay, M., B. Law & L. Reinhold (2004). Bat calls of New South Wales: Region based guide to the echolocation calls of Microchiropteran bats. Hurstville: NSW Department of Environment and Conservation.

Reardon T. B., McKenzie N. L., Cooper S. J. B., Appleton B., Carthew S. & Adams M. (2014) A molecular and morphological investigation of species boundaries and phylogenetic relationships in Australian free-tailed bats Mormopterus (Chiroptera : Molossidae). Australian Journal of Zoology 62, 109-36.

Reinhold, L., Law, B., Ford, G. and Pennay, M. 2001, Key to the bat calls of southeast Queensland and north-east New South Wales. Forest Ecosystem Research and Assessment Technical paper 2001-07, Department of Natural Resources and Mines, Queensland.

Disclaimer

Appendix J Social and Economic Assessment

16NEW0091

16 March 2023

Biodiversity Conservation Division
Department of Planning and Environment

Dear Manager,

Biodiversity Certification – Social and Economic Considerations
505 Minmi Road
Fletcher, NSW, 2287

The subject site at 505 Minmi Road, Fletcher is known as Lot 23 in Deposited Plan 1244350. It is currently subject to planning proposal (PP-2021-2262) which has received gateway determination with conditions to allow a rezoning from C4 Environmental Living to R2 Low Density Residential and C2 Environmental Conservation for up to 150 lots under Section 3.34 of the *Environmental Planning and Assessment Act 1979*.

A biodiversity assessment has been prepared in the form of a Biodiversity Certification Assessment Report (BCAR) to consider the impacts of the proposed development, which was undertaken in accordance with the *Biodiversity Conservation Act 2016* (BCA). To provide a broader context to allow the Biodiversity Conservation Division (BCD) to make an assessment in accordance with the purpose of the BCA, the following information is provided, together with the rezoning application and planning proposal.

The purpose of the BCA is outlined under Clause 1.3 which states:

> '*The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development (described in section 6(2) of the Protection of the Environment Administration Act 1991)'.*

Where ecologically sustainable development means:

> '*…ecologically sustainable development requires the effective integration of social, economic, and environmental considerations in decision-making processes.'*

To undertake any assessment under the BCA, the following must be considered:

- The greatest wellbeing of the community now and in the future.
- In the context of the integration of social, economic, and environmental considerations.

In this regard to provide some context to the decision-making requirements within this framework, it is important to understand the development so that an assessment can be made of its economic and social value for the community.

- The proposed rezoning has the potential to deliver up to 150 new allotments for residential housing on a strategically identified site.
- The future development has varying allotment sizes which contributes to delivering a mix of housing typologies.
- The future development has the potential to deliver 30 dwellings per hectare in line with the intent of the *Hunter Regional Plan 2041.*
- The proposed development is estimated to have a capital investment value exceeding $87 Million. This is broken down to an estimated $12 Million for the construction of the subdivision and an estimated $75 Million for the construction of housing
- In accordance with the *National Housing Finance and Investment Corporation Building Jobs – How residential constructions drives the economy*, on average the construction of each residential dwelling will generate three jobs or for every $1 Million input 9 job are created, being 3 construction jobs, 5 supporting industry jobs and 1 consumer industry job. Based on the CIV provided below, the project has the potential to 783 jobs consisting of:
    - 261 construction jobs
    - 435 supporting industry jobs
    - 87 consumer industry jobs
- The proposed development will conserve 12.8 hectares of land for conservation purposes.
- The conservation land will maintain green corridors throughout the local region.
- The conservation of land will provide open space opportunities for the community.

The planning strategies provide an overarching principal to guide how a community should grow and develop. The strategies are prepared with extensive stakeholder and community engagement, thus informs the issues that are important to consider for local communities and what is believed to be suitable future development.

The subject site has been identified in regional planning strategies as a suitable site for future residential development. The Lower Hunter Regional Strategy (LHRS) was prepared and endorsed by the NSW Government in 2006. This strategy outlines key urban growth corridors and green corridors across the lower Hunter. The LHRS sets out the priority for protecting the identified green corridors, whereby urban development within these areas is not supported. The excerpt below identifies the Watagan Stockton and Wallarah green corridors. From this, it is evident that the subject site falls outside the identified green corridor and is considered suitable for urban development.

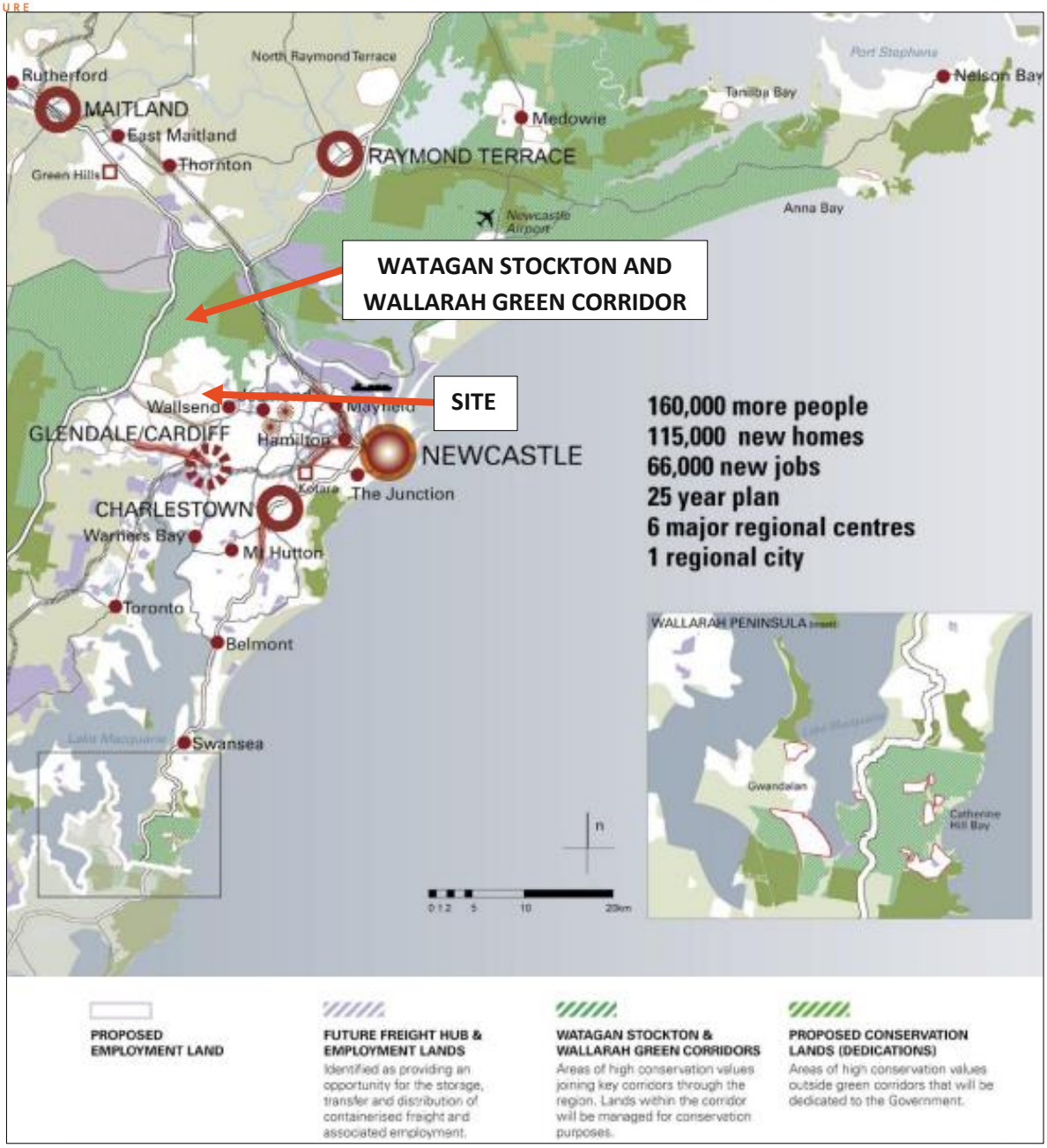


Figure 1: Watagan Stockton and Wallarh Green Corridor, Source: LHRS, 2006 p.13

Within the LHRS, the western urban corridor was identified between Edgeworth and Glendale. In 2010 the NSW Government endorsed the Newcastle-Lake Macquarie Western Corridor Planning Strategy (WCPS). This strategy encompassed the Edgeworth-Glendale growth corridor and identified a broader strategy area for future urban, employment areas and conservation corridors. The figure below shows this strategy area and identified offset lands. The offset lands is consistent with the established Watagan Stockton and Wallarah green corridor established under the LHRS. The site remains outside of this conservation area.

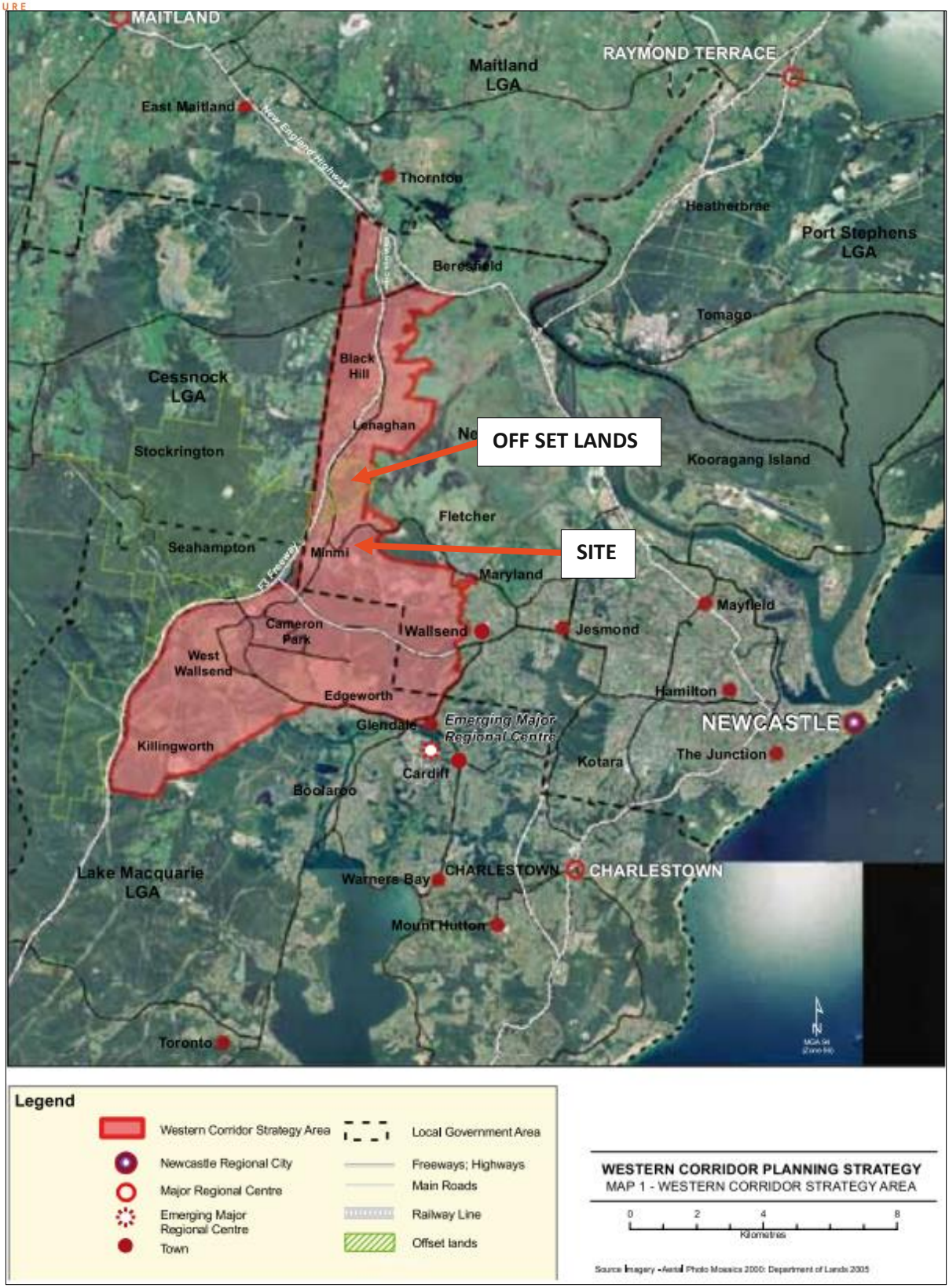


Figure 2: Western Corridor Strategy Area, Source: Newcastle and Lake Macquarie Western Corridor Planning Strategy, 2010, p.3

Chapter 7 of the WCPS identifies the preferred land use to accommodate approximately 8,000 new housing sites, 1,.500 hectares of employment lands and conservation lands. The figure below demonstrates that the preferred land use of the site is for residential development connecting the existing urban areas of Fletcher and Minmi, outside of the Watagan Stockton Green Corridor.

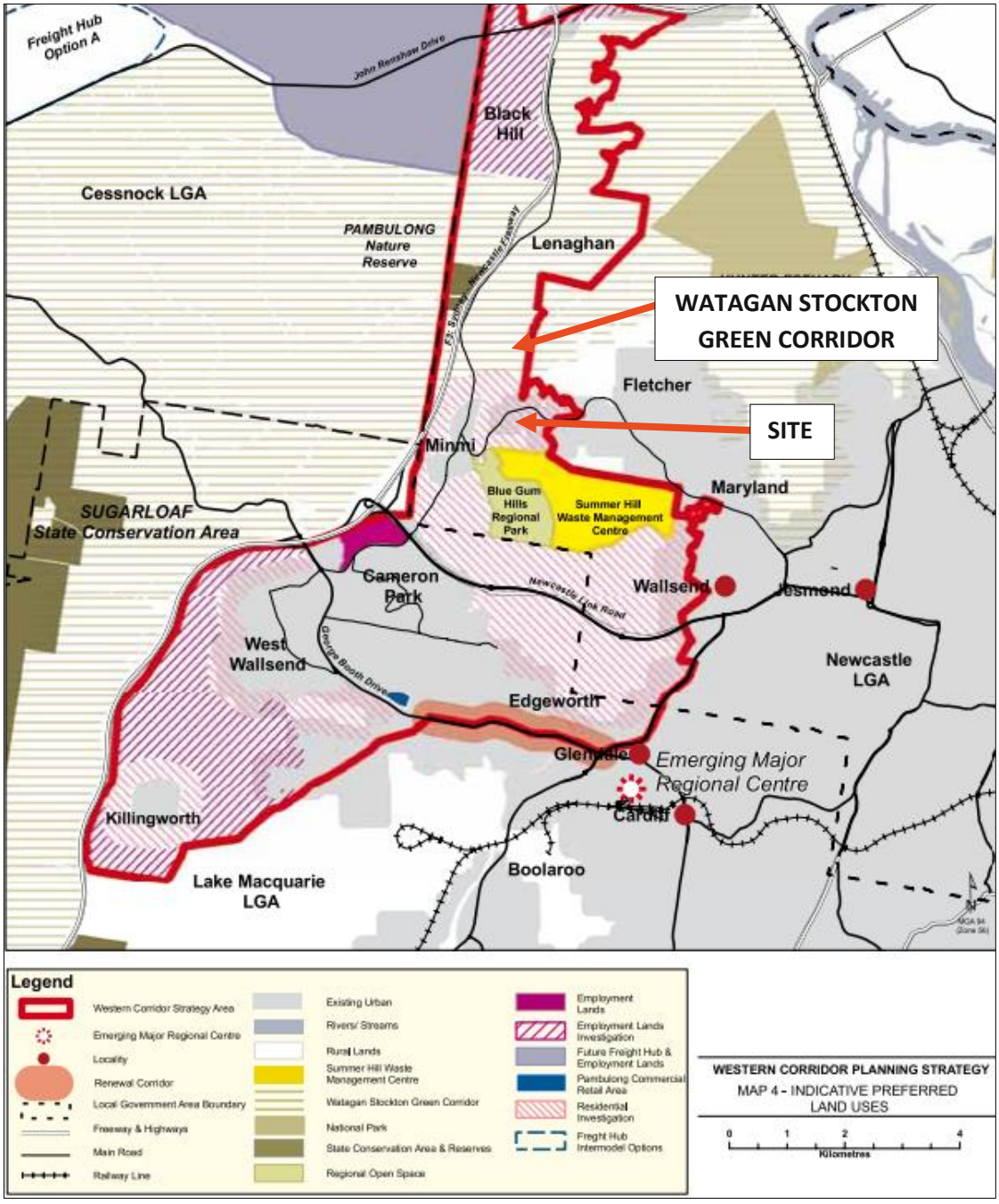


Figure 3: Preferred land uses, Source: Newcastle Lake Macquarie Western Corridor Planning Strategy, 2010, p.27

The Hunter Regional Plan 2041 (HRP) is the current strategic strategy that guides development across the Hunter Region. This plan was endorsed by the NSW Government in December 2022 and replaces the Hunter Regional Plan 2036. Within the current HRP, the site is identified within a regionally significant area. The site

is identified as land within the Hunter Urban Delivery Program for residential development. The map, provided below, shows the site remains outside of the biodiversity corridor.

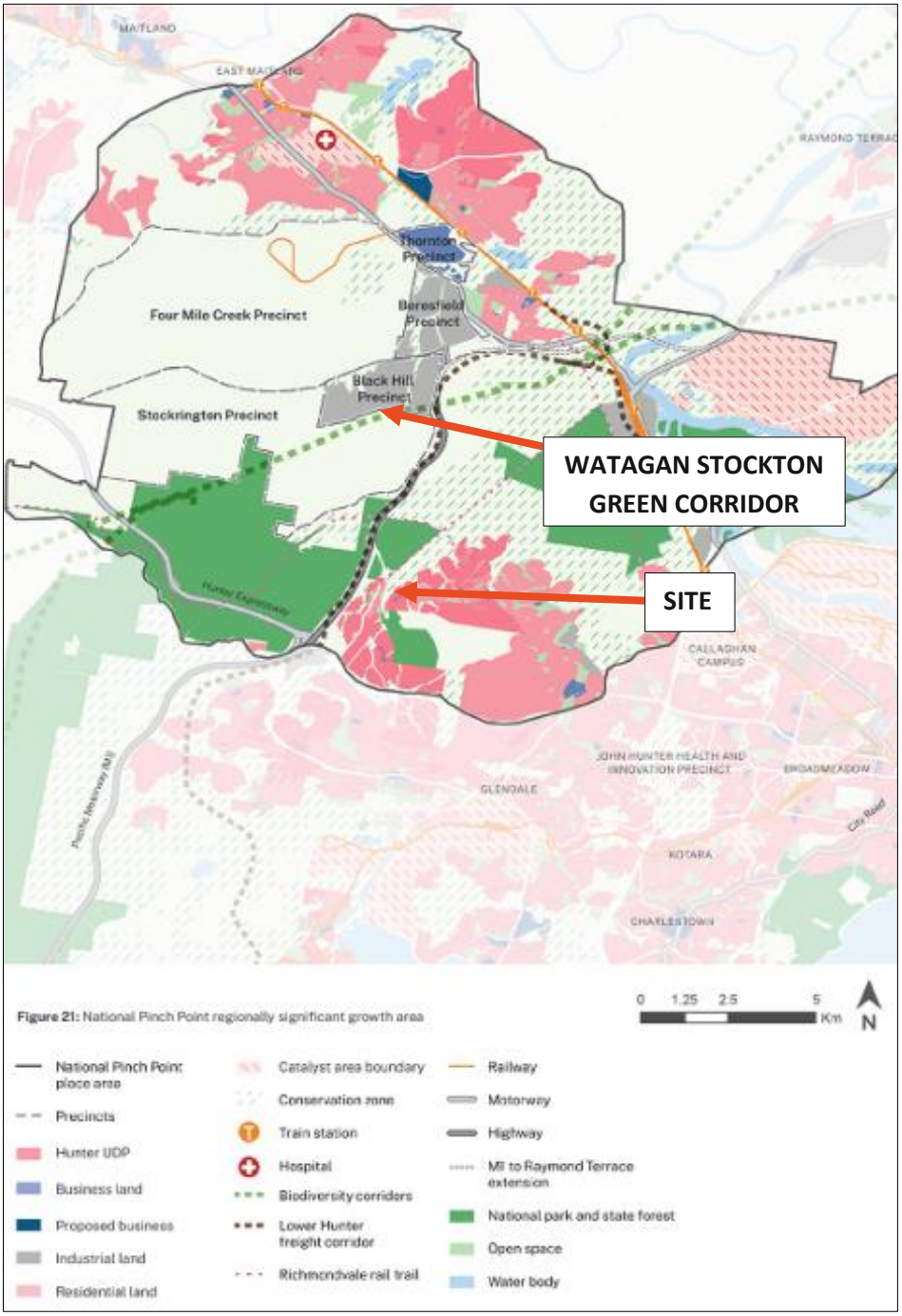


Figure 4: Regionally significant growth area and future intended land use, Source: Hunter Regional Plan, 2041, p.116

As demonstrated, the site has a long history being supported for urban residential development and has not been identified within the protected Watagan Stockton and Wallarah green corridor. The Planning Proposal supporting the LEP amendment provides further information regarding the impacts of the development from a social and economic perspective.

Social Assessment

In accordance with the BC Act 2016 and detailed above, the authority must consider how to achieve ecological sustainable development (ESD). ESD incorporates a balance three key elements, being:

- Environment
- Social; and
- Economic.

To understand how the development impacts upon the social element, it must first be understood what is social impact. Social impact is a change to the way in which a person interacts with the built and natural environment in either a positive or negative way. The change can impact upon the way they live, their culture, their community, political systems, their environment, their health and wellbeing, personal and property rights and generate fears or aspirations about the future of their community.

The proposed development seeks to rezone a strategically identified site to establish up to 150 housing allotments and conserve 12.8 hectares of vegetation. The proposal seeks to achieve a residential density of 30 dwellings per hectare, providing a change in potential building typology and housing availability in the locality. The proposal not only supports the objectives of the HRP 2041, yet the change in housing diversity will aid a range of property and housing prices. This has the potential to allow new home owners enter into the housing market and will provide additional housing in an identified growth area. When living within a time of a housing crisis, creating new land opportunities to supply housing will support individuals in the way they live and provide housing security improving their overall health and wellbeing.

Over the last 10-15 years, the Minmi area has undergone extensive transformation. Due the strategic merit of the area along with the need to provide new residential land to accommodate a growing population there has been a transition to a more urbanised land form. The proposal is consistent with the preferred intended land use and contributes the transitioning nature of the locality. Accordingly, the proposal is considered consistent with the intended use of the area and does not result in substantial adverse social impacts given the long history of strategic merit for residential development of the site.

It is important to recognise the proposal seeks to conserve 12.8 hectares or 49% of the site for environmental conservation. Whilst an environmental impact is noted, the proposal has considered a balance between the environment and the availability of housing within a greenfield site. Supported by the BCAR, conservation of the land supports biodiversity outcomes on the site and through the proposed avoiding, maintaining and offsetting strategy the environmental impact can be minimised and managed. The conservation of the proposed C2 zoned land not only supports biodiversity, yet has a positive social impact through maintaining future amenity of the residential estates. The future residents will be nestled around the bushland providing opportunities to engage with nature which is known to have positive mental and physical health outcomes.

The temporary construction impacts to amenity including noise and dust may be mitigated through the preparation of a Construction Management Plan (CMP). This will include general industry standards for activity on and around the site, and such site-specific provisions as may be required to ensure that effects are avoided, managed, or mitigated to the relevant practicable extent.

Longer term effects are likely to be largely related to increased vehicular traffic, consistent with the use of the land for residential purposes. A Traffic Impact Assessment (TIA) has been prepared for the site and indicates that there is capacity in the local road network to accommodate the additional traffic.

Economic Assessment

Generally, an economic assessment accounts for the construction and operational jobs provided by a development. The proposal for residential land use will mainly generate future construction jobs. The National Housing Finance and Investment Corporation *Building Jobs – How residential constructions drives the economy* is used the estimate the future jobs created by residential construction. The Report identifies two methodologies being:

- Three jobs will be generated for each residential dwelling constructed; or
- For every $1 Million input, 9 jobs are created being 3 construction jobs, 5 supporting industry jobs and 1 consumer industry job.

Using the first methodology, the proposal seeks to deliver between 120 and 150 new dwellings. As such, this project has the potential to create 360-450 construction jobs for future housing.

Alternatively, the future capital investment value (CIV) is estimated to be approximately $87 Million. Based on this CIV, the project has the potential to 783 jobs consisting of:

- 261 construction jobs
- 435 supporting industry jobs
- 87 consumer industry jobs

Generation of future construction jobs has both an economic and social benefit. Job security contributes to personal economic stability, reducing overall stress and contributing to positive health and wellbeing outcomes. The monetary input into the local construction market contributes to economic growth. Further long term population growth provides increased investment and expenditure into the local economy, having flow-on effects for local businesses.

The NSW Treasury[1] considers an economic appraisal of a development should also show the following broader considerations:

- Whether the benefits of a proposed project are likely to exceed its costs.
- Which among a range of options to achieve an objective has the highest net benefit; or
- Which option is the most cost effective, where benefits are equivalent.

There were two alternative options considered other than the preferred option provided within the planning proposal, these are detailed below for consideration.

[1] NSW Treasury (July 2007). NSW Government Guideline for Economic Appraisal, TPP07-5.

1. **A 'do nothing' approach** would mean not investing in new residential development opportunities. This would result in not responding to the significant ongoing population growth within the Greater Newcastle area and demand for housing. Without available and affordable residential land, it is only expected that the housing crisis would further deteriorate. As housing shortages increase and affordability decreases, there is a downward push on people with low socioeconomic status and high levels of disadvantage. Subsequently, the burden falls to public housing providers and non-for-profit organisations to support the increase in homelessness.

2. **Full residential rezoning of the site** would mean that new residential development opportunities would be at the cost of biodiversity and environmental outcomes. This would result in poor ecological outcomes whereby serious irreversible impacts may result.

3. **A reduced developable area** would result in a decreased development footprint and a reduction in residentially zone land. This would result in a reduction in available housing allotments which has a flow on effect for reducing the impacts of housing availability and affordability and meeting the predicted population growth for the Greater Newcastle region.

The option provided within the BCAR has considered the ecological values and the future residential development area to establish what is considered the be a balance between conservation and development. The proposal retains 49% of the site for conservation whilst allowing 51% to provide up to 150 new dwelling allotments. The proposal outlined within the BCAR is considered to have the most economic benefit for the development and community.

Taking a long-term view of the proposal has taken a holistic approach and considered the principles of ecologically sustainable development to create a balance between the environmental, economic and social benefits the future development of this site can achieve.

Ecologically Sustainable Development

Noting the objectives of the BC Act is to achieve Ecologically Sustainable Development, the ESD principals have been addressed in association with the development proposal. The considerations provide assurance of the overall benefits provided by development and its ongoing ability to be an ecologically sustainable development.

Table 1 ESD Considerations by Steensen Varming [2]

[2] Steensen Varming (2022). St. Philip's Christian College, Charmhaven, ESD Report for SSDA.

ESD Principal	Comment
The precautionary principle, namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by— Careful evaluation to avoid, wherever practicable, serious, or irreversible damage to the environment, and An assessment of the risk-weighted consequences of various options.	The project has been designed in accordance with the avoid, maintain and offset framework to establish a rezoning boundary. The BCAR demonstrates that the current rezoning footprint does not result in serious irreversible impacts that cannot be managed or offset. The future community title subdivision will result in the C2 zoned land being maintained under a vegetation management plan, either attached to the community management plan or via the creation of a stewardship site. The conservation of this area will have positive impacts for both the environment and the residential amenity of the area. The conservation area will maintain a vegetation corridor across the site and secures the conservation of the ecological communities. The zoning boundary has been established through ongoing consultation throughout the planning proposal assessment process and relevant stakeholders. The proposed zoning boundary establishes a balance of residential allotment delivery with environmental conservation to establish positive social impacts.
Inter-generational equity, namely, that the present generation should ensure that the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations.	The planning proposal seeks to conserve 49% of the site as conservation land. The function of this conservation will ensure: ▪ Biodiversity is protected in perpetuity for future generations ▪ Through a vegetation management plan either attached to the community management plan or via the creation of a stewardship site the productivity of the conserved land will be maintained or enhanced. ▪ At the development stage, energy, water and waste reduction and conservation measures can be implemented to reduce consumption of non-renewable resources. ▪ Landscape strategies and WSUD features to enhance biodiversity and the site's ability to passively control stormwater can be included in the development stage.

ESD Principal	Comment
Conservation of biological diversity and ecological integrity, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,	The zoning boundary has been established to ensure biological diversity is maintained and ecological integrity in improved through the conservation of C2 zoned land. Further additional landscaping of the road verges within the residential estates will be provided as part of the development stage. The landscaping strategy will consider the ecological values of the C2 zoned land and used endemic species to facilitate integration between the zones.
improved valuation, pricing, and incentive mechanisms, namely, that environmental factors should be included in the valuation of assets and services, such as— Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance, or abatement. The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.	Strategies will be considered as part of the detailed design stage to achieve the highest sustainability and environmental performance while aiming to remain within budget and minimise high costs

As detailed within the BCAR provided, the process of avoid, minimise and offset have been undertaken as part of the assessment, in that order, having consideration of the social and economic outcomes of the development and their alignment with both the Local and State Government policies.

The parcel as it currently stands, has historically been identified for residential development outside of key biodiversity corridors. Under the proposed LEP amendment, the rezoning would create a balance between environmental conservation and residential development, thus establishing environmental, social and economic benefits for the future of the local community.

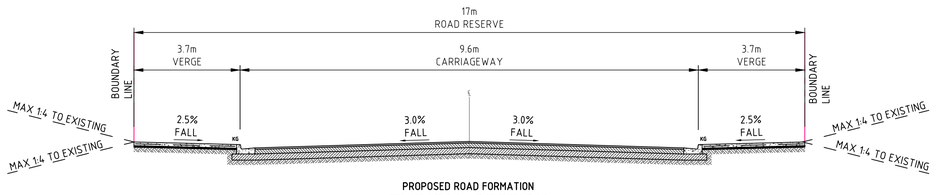
This submission relies heavily on the identification of the site under current State Government Strategies which identify the site, and have identified the site for residential development for more than 15 years. It is important to note that the current strategy, The Hunter Regional Plan 2041, according to its introduction has been prepared under the Environmental Planning and Assessment Act 1979. The objects of the Act include "to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment". The strategy, having had regard for this principle of the EP and A Act, has considered the balanced outcomes for the Hunter and as a result has identified the land for residential investigation as part of that process. This submission has articulated the social and economic benefits of the individual site, however, this needs to be read in the context of the broader strategy in meeting the principles of ESD.

If you have any queries regarding this information, please do not hesitate to contact me as below.

Yours sincerely.

Stephen Barr
Director
sbarr@barrpandp.com.au
0422 570 345

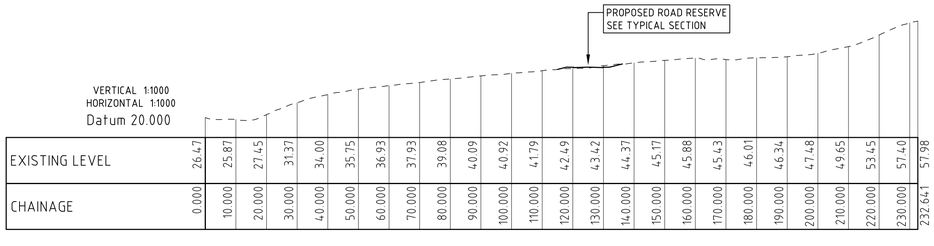
Appendix K Road Section Plan



PROPOSED ROAD FORMATION

TYPICAL SECTION

SCALE 1:50



CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	230.000	232.641
EXISTING LEVEL	26.47	25.87	27.45	31.37	34.00	35.75	36.93	37.93	39.08	40.09	40.92	41.79	42.49	43.42	44.37	45.17	45.88	45.43	46.01	46.34	47.48	49.65	53.45	57.40	57.98

SECTION A

NOT FOR CONSTRUCTION

DRAWN: JBOOTHBY DESIGNED: C.PIPER JOB MANAGER: C.PIPER VERIFIER: C.PIPER

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	JB		CP	10.03.23
2	ISSUED FOR INFORMATION	JB		CP	14.03.23

CLIENT

DRAWING NOT TO BE USED FOR CONSTRUCTION UNLESS VERIFICATION SIGNATURE HAS BEEN ADDED

ARCHITECT

moir landscape architecture

ALL DIMENSIONS TO BE VERIFIED ON SITE BEFORE COMMENCING WORK.
NORTHROP ACCEPTS NO RESPONSIBILITY FOR THE USABILITY, COMPLETENESS OR SCALE OF DRAWINGS TRANSFERRED ELECTRONICALLY.
THIS DRAWING MAY HAVE BEEN PREPARED USING COLOUR, AND MAY BE INCOMPLETE IF COPIED TO BLACK & WHITE.

SCALE 1:1000 @ A1

0 10 20 30 40 50m

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ABN 81 094 433 100

PROJECT

505 MINMI ROAD, FLETCHER, NSW 2287

DRAWING TITLE

CIVIL SKETCH

ROAD SECTION PLAN

JOB NUMBER **NL230615**

DRAWING NUMBER **CSK1.01**

REVISION **2**

DRAWING SHEET SIZE = A1

Date: 14.03.2023 3:20 PM Plotted By: RKENNEDY Found: \\ne-ndfp1\pb_files1\YEAR 2023 Jobs\NL230615 - 505 Minmi Rd Fletcher\O - Drawings\CIVIL\02-SKETCH\CSK1.01 ROAD PLAN\NL230615-CSK1.01_ROAD SECTION PLAN.DWG

Appendix L Microbat Roost Habitat Search Area

505 MINMI RD, FLETCHER

MICROBAT ROOST HABITAT SEARCH AREA

Legend

- Subject Land
- Impact Boundary
- 2 km Buffer from Subject Land
- 100 m Buffer from Escarpment

Vegetation

- PCT 0
- PCT 1568
- PCT 1588
- PCT 1589
- PCT 1592
- PCT 1619
- PCT 1718
- PCT 1727
- PCT 1729
- PCT 1736
- PCT 1737

- Contours (5 m)
- Escarpment

Watercourse

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

0 300 600 900 1,200

Metres

1:18000

N W E S

MJD Environmental

Aerial: Nearmap (2023) | Data: MJD Environmental, NSW Spatial Services (2023) | Datum/Projection: GDA94 / MGA zone 56 | Date: 28/07/2023 | Version: 1 | Z:\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimension.

Appendix M Amendments to zoning boundary

505 MINMI RD, FLETCHER

AMENDMENT TO ZONING BOUNDARY – BIODIVERSITY AVOIDANCE

0 45 90 180

Meters

1:2,700

Legend

Final Proposal (2023)	Ammended Proposal (2022)	Initial Submission (2020)
C2: Environmental Conservation	C2: Environmental Conservation	E2: Environmental Conservation
R2: Low Density Residential	R2: Low Density Residential	R2: Low Density Residential

MJD Environmental

N W E S

Aerial: NearMap (2023) | Data: MJD Environmental (2023), Moir LA (2021), NSW Spatial Services (2023) | Datum/Projection: GDA 1994 MGA Zone 56 | Date: 27/10/2023 | Version 1 | GIS\19082 - Planning Proposal 505 Minmi Rd, Fletcher | This plan should not be relied upon for critical design dimensions.

Appendix N Personnel Qualifications

Name	Title	Qualifications	Roles
Matt Doherty	Director	▪ BAM Assessor (#BAAS17044) ▪ B. Landscape Management and Conservation - Soil and Water Management ▪ Bush Regeneration Cert IV	Review BCAR for submission Provide guidance on BAM calculator assessment
Maddy Walsh	Senior Ecologist	▪ BAM Assessor (#BAAS21010) ▪ B. Environmental Biology (Honours)	Undertake BAM assessment and prepare BCAR. Undertake BAM Calculator assessment. Conduct BAM floristic plots. Targeted field survey methodology determination Field work including vegetation mapping, threatened flora and fauna surveys.
Coral Pearce	Principal Ecologist	▪ BAM Assessor (#BAAS21024) ▪ Master Science – Mammal Ecology ▪ B. Applied Science - Ecology	Review BCAR for submission Provide guidance on BAM calculator assessment Conducted targeted threatened fauna searches
Ross Duncan	Senior Environmental Consultant	▪ B. of Environmental Science & Ecosystem Rehabilitation	Conducted targeted threatened fauna searches
Adam Cavallaro	Senior Ecologist	▪ BAM Assessor (#BAAS18056) ▪ B. Environmental Science - Conservation Ecology ▪ Bush Regeneration Cert IV	PCT identification and vegetation mapping
Phoebe Smith	Ecologist	▪ B. Environmental Science and Management (Honours) ▪ Master Environmental - Management & Sustainability	Undertake BAM assessment. Undertake PCT and VZ delineation. Conduct BAM floristic plots. Targeted field survey methodology determination. Field work including PCT identification, vegetation

Name	Title	Qualifications	Roles
			mapping, and threatened flora and fauna surveys.
Bret Stewart	Ecologist	▪ B. Science - Evolution and Ecology	Fieldwork including threatened flora and fauna surveys.
Robert Fay	Field Ecologist	▪ B. Environmental Science and Management	Fieldwork including threatened flora and fauna surveys, assisting with BAM plots.
Ali Bragg	Field Ecologist	▪ B. Animal Science (Honours)	Fieldwork including threatened flora and fauna surveys.
Max Manion-Sharrock	Field Ecologist	▪ B. Environmental Science and Management	Conducted targeted threatened fauna searches
Ellen Saxon	GIS Coordinator	▪ B. Environmental Science and Management - Ecosystems & Biodiversity ▪ Conservation & Land Management Diploma, Cert. II & III	Produce figures for BCAR and Spatial Data Management for Project Review BCAR for submission
Alexander Jeffery	Field Ecologist	▪ B. Environmental Science & Management (Honours) ▪ B. Science	Fieldwork including threatened flora and fauna surveys
Chris Spraggon	Ecologist	▪ B. of Science - Marine Science (Honours) ▪ Conservation and Land Management Cert III	Fieldwork including threatened flora and fauna surveys
Josh Smart	Field Ecologist	▪ B. Marine Environment ▪ B. Environmental Science & Management (Honours)	Fieldwork including threatened flora and fauna surveys
Laura Smith	Field Ecologist	▪ B. Environmental Science & Management	Fieldwork including threatened flora and fauna surveys
Mathew Grassi	Field Ecologist	▪ B. Environmental Science & Management - Ecosystems & Biodiversity	Fieldwork including threatened flora and fauna surveys
Nixon Jowett	Field Ecologist	▪ B. Environmental Science and Management ▪ Geospatial Intelligence Grad Cert	Fieldwork including threatened flora and fauna surveys
Simone-Louise Yasui	Ecologist	▪ Doctor of Philosophy in Biological and Environmental Sciences ▪ Masters in Ecology and Evolutionary Biology ▪ B. of Science (Honours)	Fieldwork including threatened flora and fauna surveys

Name	Title	Qualifications	Roles
Stephanie Sheehy	Field Ecologist	▪ B. Environmental Science and Management - Ecosystems & Biodiversity ▪ Business Administration Cert III	Fieldwork including threatened flora and fauna surveys
Tom Fletcher	Field Ecologist	▪ B. Environmental Science & Management - Marine	Fieldwork including threatened flora and fauna surveys