
# Biodiversity Development Assessment Report

Erith Street, Bundanoon

Report prepared for Civil Development Solutions on behalf of R.G. Capital

August 2022

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As the accredited assessor, I Chris Moore, certify that:

- The information presented in this report is a true and accurate record of the study findings in the opinion of the authors.

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# Glossary

| Acronym/ Term | Definition |
|---|---|
| Accredited Biodiversity Assessor | Individuals accredited by the Department of Planning, Industry and Environment (DPIE) to apply the Biodiversity Assessment Method. |
| BAM | The NSW Biodiversity Assessment Method |
| BAMC | The NSW Biodiversity Assessment Method Calculator |
| BC Act | New South Wales Biodiversity Conservation Act 2016 |
| BDAR | Biodiversity Development Assessment Report |
| Biodiversity credit report | The report produced by the Credit Calculator that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site. |
| Biodiversity Offsets | Management actions that are undertaken to achieve a gain in biodiversity values on areas of land in order to compensate for losses to biodiversity from the impacts of development. |
| Biodiversity values | The composition, structure and function of ecosystems, including threatened species, populations and ecological communities, and their habitats. |
| BOS | NSW Biodiversity Offset Scheme |
| DA | Development Application |
| DPIE | NSW Department of Planning, Industry and Environment (formerly OEH) |
| Ecosystem credit | A credit that relates to a vegetation type and the threatened species that are reliably predicted by that vegetation type (as a habitat surrogate). |
| EEC | Endangered Ecological Community |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 |
| ha | Hectare |
| HTE | High Threat Exotic |
| IKPoM | Individual Koala Plan of Management |
| km | Kilometre |
| LGA | Local Government Area |
| Locality | The area within a 10km radius of the Subject Land. The same meaning when describing a local population of a species or local occurrence of an ecological community. |
| m | metres |
| MNES | Matters of National Environmental Significance |
| Native Vegetation | Means any of the following types of plants native to New South Wales:(a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland. |
| NSW | The State of New South Wales |
| OEH | Office of Environment and Heritage (now DPIE) |
| PCT | NSW Plant Community Type |
| Priority weed | Priority weeds of the South East as per the *Biosecurity Act 2015* |
| Proposal | The development, activity or action proposed. |
| SAII | Serious and Irreversible Impacts |
| SAII entity | Species and ecological communities that are likely to be the subject of serious and irreversible impacts (SAIIs) |
| SEPP | State Environmental Planning Policy |
| Species credit | The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection. |

| Acronym/ Term | Definition |
|---|---|
| Study Area | The area that was subject to a site survey and assessed for direct or indirect impacts arising from construction and operation of the proposal. |
| Subject Land | The location of the proposed activity, the subject of this report. |
| Subject Property | Erith Street Bundanoon NSW 2578 (Lot 18/DP 1219744) |
| Threatened biota | Threatened species, populations or ecological communities listed under the BC Act and/or the EPBC Act. |
| Threatened species, populations and ecological communities | Species, populations and ecological communities specified in Schedules 1, 1A and 2 and '*threatened species, population or ecological community*' means a species, population or ecological community specified in any of those Schedules. |
| TPZ | Tree Protection Zone: A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development |
| VIS Plot | Vegetation Integrity Survey Plot |

# Executive Summary

Civil Development Solutions on behalf of R.G. Capital propose to undertake a subdivision at the property on Lot 18 DP 1219744 Erith Street, Bundanoon NSW 2578.

As the proposed subdivision will exceed the clearing threshold (0.25ha) for a property with a minimum lot size of less than 1ha, the Biodiversity Offset Scheme (BOS) is triggered and a Biodiversity Development Assessment Report (BDAR) is required to be undertaken by an accredited assessor to assess the impacts of the proposal.

This BDAR has been prepared by Narla Environmental Pty Ltd to identify the potential impacts of the proposal on biodiversity values within the Subject Land. This assessment has been completed in accordance with the Biodiversity Assessment Method (BAM) and includes:

- Comprehensive literature review and desktop assessment to describe the historically recorded environment and landscape features of the Subject Land and to identify the suite of threatened biota potentially affected by the proposal;
- Site assessment to describe the biodiversity values of the Subject Land and to determine the likelihood of threatened biota and their habitats occurring within the proposed activity footprint;
- Targeted field surveys for a suite of candidate species credit species identified by the Biodiversity Assessment Method Calculator (BAMC) as likely to occur within the native vegetation of the Subject Land in accordance with the relevant NSW threatened species survey guidelines;
- Discussion and recommendation of measures to avoid and minimise impacts to biodiversity values;
- Discussion on impacts to biodiversity values including Serious and Irreversible Impacts (SAII); and
- BAM calculations using the BAMC version 1.4.0.00 to quantify the level of biodiversity impacts of the proposal following the implementation of measures to avoid and minimise impacts, and to determine the biodiversity credits that will need to be purchased and retired to offset the residual impacts of the proposal.

The Subject Land has experienced historically clearing and alteration, typical of an urban landscape comprising of sections of intact remnant vegetation and paddocks containing native and exotic grasses and groundcover species.

One (1) Plant Community Type, PCT 944: *Mountain Grey-gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion* was located within the Subject Land. This vegetation community is consistent with Southern Highlands Shale Woodlands in the Sydney Basin Bioregion in the Sydney Basin Bioregion, which is listed as an Endangered Ecological Community under the NSW Biodiversity Conservation Act 2016 (BC Act). This threatened ecological community was identified as an SAII entity, therefore a determination of whether or not the proposed impacts would be considered likely to cause a serious and irreversible impact was undertaken in accordance with Section 9.1 of the BAM (DPIE 2020a). Furthermore, the vegetation within the "Canopy Condition" PCT 835 was found to meet the EPBC listing for the critically endangered Southern Highlands Shale Forest and Woodland in the Sydney Basin Bioregion. The following ecosystem credits are required to be offset in order to mitigate the impacts of the proposed development:

- 53 credits for PCT 944.

Targeted surveys were conducted within the appropriate survey period for all species predicted to occur by the BAMC with One (1) Species Credit species being confirmed present as utilising the Subject Land. Biodiversity offset credit calculations have been performed in accordance with the BAM (DPIE 2020a) and using the BAMC Version 1.4.0.00 (DPIE 202ab). The following species credits are required to be offset in order to mitigate the impacts upon biodiversity as a result of the proposed development:

- 51 Southern Myotis Species Credits.

The preferred approach to offset the residual impacts of the proposal is to purchase and retire the appropriate credits from stewardship sites that comply with the trading rules of the NSW BOS in accordance with the 'like for

like' report generated by the BAMC. If such credits are unavailable, credits would be sourced in accordance with the 'variation report' generated by the BAMC. A payment to the Biodiversity Conservation Trust would be considered as a contingency option if a suitable number and type of biodiversity credits cannot be secured.

In order to avoid and minimise potential impacts of the proposal on local biodiversity values, a series of mitigation and management measures have been identified, which are to be implemented as part of any Construction Environmental Management Plan (CEMP) produced for the site. These include measures to:

- Ensure all contractors employed to work within and around identified biodiversity values within the Subject Land are suitably qualified and experienced;
- Implement all relevant biological hygiene protocols and requirements as per NSW Government guidelines.

In addition, a site-specific Vegetation Management Plan (VMP) has been created to outline the restoration and protection of the first order watercourse located along the southern border of the property, as well as the remnant vegetation to remain in the northern corner. These areas have been dedicated as "Community Lots".

# 1. Introduction

## 1.1 Overview

Narla Environmental Pty Ltd (Narla) was commissioned by Civil Development Solutions on behalf of R.G. Capital ('the proponent') to prepare this BDAR to accompany a Development Application (DA) for the proposed subdivision at Erith Street Bundanoon NSW 2578 (Lot 18/DP 1219744; hereafter referred to as the 'Subject Property').

The proposed subdivision is subject to DA approval and has triggered a BDAR as it will exceed the clearing threshold (0.25ha) for a property with a minimum lot size of less than 1ha.

## 1.2 The Proposed Subdivision

The proposed subdivision will involve the creation of building envelopes, driveway, 1m subdivision fencing buffer, drainage and sewerage systems as well as additional tree removal and Asset Protection Zones (APZ) (Inner and Outer Protection Areas, including in the proposed 88b easement). All areas associated with the proposed subdivision will hereafter be referred to as the "Subject Land". The Subject Land covers an area of approximately 5ha, across the majority of the Subject Property (**Figure 1**), and is comprised of remnant intact vegetation and historically cleared grassland.

The proposed subdivision has been designed in a way that will minimise the potential impacts on biodiversity where possible. A large section of remnant vegetation will remain in the northern most section of the site, with a proposed drainage reserve to be established in the south that will see a complete revegetation of appropriate flora species representative of the surrounding community. These areas have been allocated as community lots to ensure their ongoing protection.

Narla have produced this report in order to assess any potential impacts associated with the DA and recommend appropriate measures to mitigate any potential ecological impacts in line with the requirements of the Consent Authority, Wingecarribee Shire Council.

## 1.3 Site Location and Description

The Subject Property is situated within the suburb of Bundanoon within the Wingecarribee Shire Council Local Government Area (LGA; **Figure 2**), covering an area of approximately 10.33 ha that is surrounded by mostly vacant lots and rural properties. The Subject Property also contains a dam that is located along a 1$^{st}$ order, unnamed tributary of Reedy Creek, which runs along the property's southern boundary.

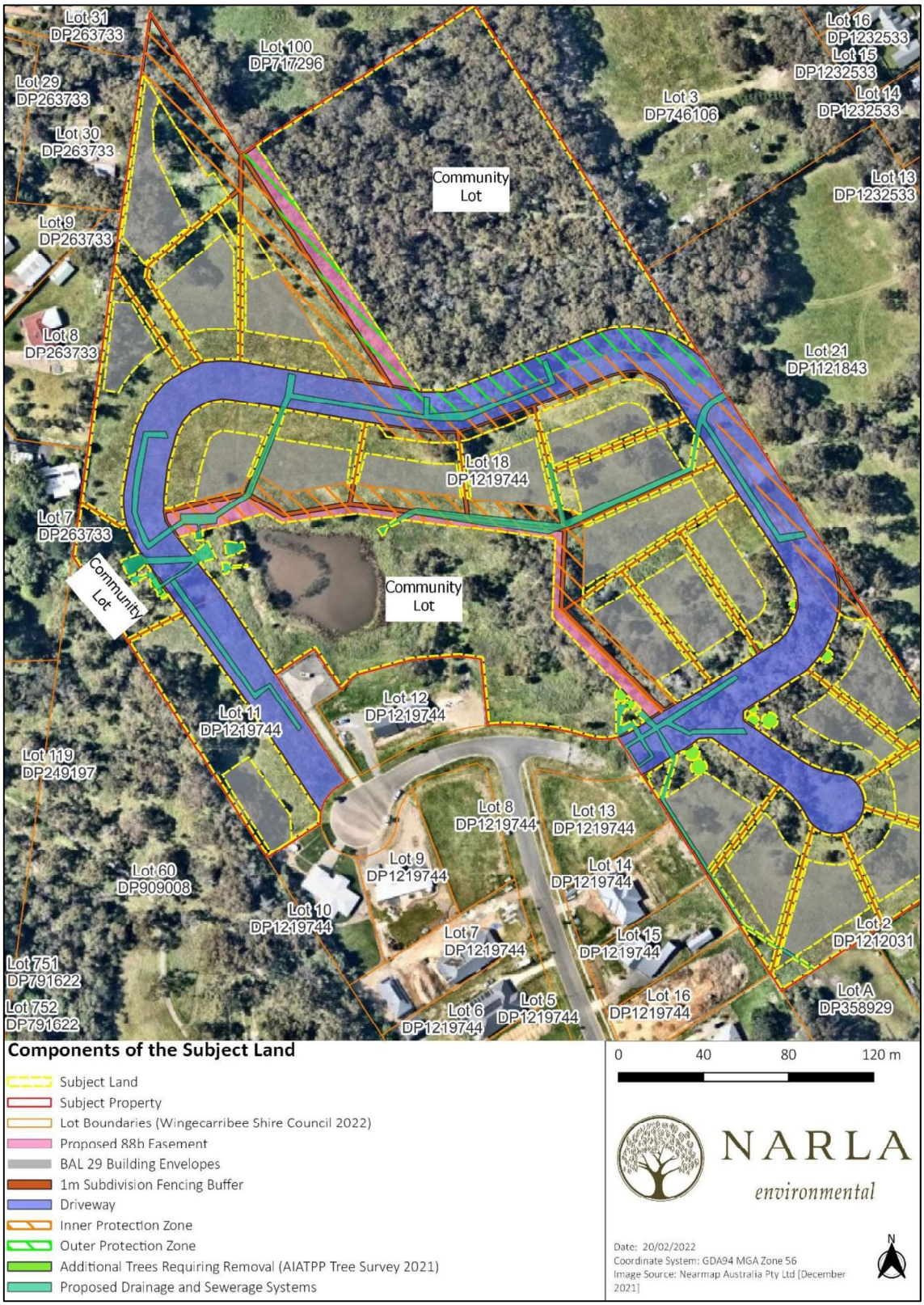


Figure 1. The location of the Subject Property (inset) and Subject Land within the greater locality

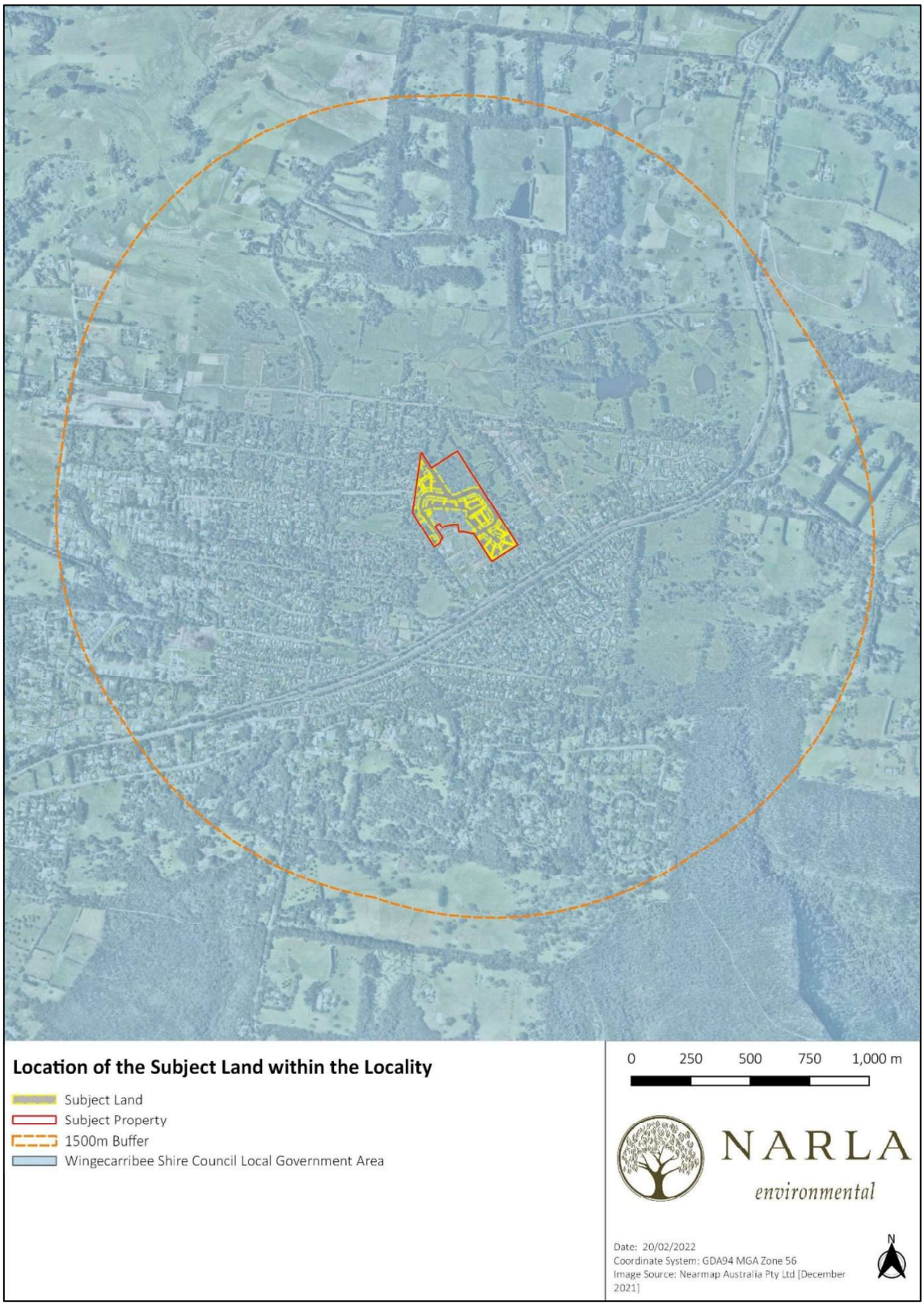


Figure 2. Location of the Subject Land within the Local Government Area

## 1.4 Sources of Information Used

A thorough literature review was undertaken to review the ecology within the locality and the Wingecarribee LGA. Relevant data and literature reviewed in preparation of this report included:

- Relevant State and Commonwealth Databases:
    - Atlas of Living Australia Spatial Portal (ALA 2022);
    - NSW BioNet. The website of the Atlas of NSW Wildlife (DPIE 2022); and
    - Protected Matters Search Tool (DAWE 2022).
- Relevant State and Commonwealth Datasets:
    - NSW Government Spatial Services: Six Maps Clip & Ship ;
    - NSW State Environmental Planning Policy (Coastal Management); and
    - NSW State Environmental Planning Policy (Koala Habitat Protection) 2021.
- NSW Scientific Committee Final Determinations for:
    - Southern Highlands Shale Woodlands in the Sydney Basin Bioregion – endangered ecological community listing (NSW Scientific Committee 2011).
- Vegetation Mapping:
    - Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands (Tozer et al. 2010).
- NSW State Guidelines:
    - Biodiversity Assessment Method Calculator Version 1.4.0.00 (DPIE 2021b);
    - BioNet Threatened Biodiversity Data Collection (DPIE 2022c);
    - Biodiversity Assessment Method (DPIE 2020a);
    - Threatened Species Survey and Assessment: Guidelines for developments and activities. Working Draft (DEC 2004);
    - Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method (DPIE 2020d);
    - 'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method (OEH 2018a);
    - Guidance to assist a decision-maker to determine a serious and irreversible impact (DPIE 2019a); and
    - Biodiversity Offsets and Agreement Management System (BOAMS).
- Council Documents:
    - Bundanoon Township Development Control Plan (DCP) 2019;
    - Wingecarribee Local Environmental Plan (WLEP) 2010; and
    - Weeds Declared in the South East (DPI 2022).

Preparation of this BDAR also involved the review of the following accompanying project documents:

- Civil Development Solutions (2021) Concept Drainage Plan;
- Addendum to Bushfire Hazard Assessment: subdivision, 7 Reg Grundy Drive, Bundanoon, NSW (Harris Environmental Consulting 2022); and
- Arboricultural Impact Assessment and Tree Protection Plan Version 2 (Tree Survey 2021).

Online databases and literature review were utilised to gain an understanding of the natural environment and ecology of the Subject Land and its surrounds to an area of approximately 10 km². Searches utilising NSW Wildlife Atlas (BioNet) and the Commonwealth Protected Matters Search Tool were conducted to identify current threatened and migratory flora and fauna records within a 10km radius search area centred on the Subject Land.

This data was used to assist in establishing the presence or likelihood of any such ecological values as occurring on or adjacent to the Subject Land and helped inform our Ecologist on what to look for during the site assessment.

Soil landscape and geological mapping (Department of Environment and Climate Change 2009) was examined to gain an understanding of the environment on the Subject Land and assist in determining whether any threatened flora or ecological communities may occur.

## 1.5 Aim and Approach

This report has been prepared in accordance with the BAM (DPIE 2020a) and aims to:

- Describe the biodiversity values present within the Subject Land, including the extent of native vegetation, vegetation integrity and the presence of threatened ecological communities (TECs);
- Determine the habitat suitability within the Subject Land for candidate threatened species;
- Prepare an impact assessment in regard to potential impacts of the proposed development on biodiversity values, including potential prescribed impacts and serious and irreversible impacts (SAIIs) within the Subject Land;
- Discuss and recommend efforts to avoid and minimise impacts on biodiversity values; and
- Calculate the biodiversity credits (i.e. ecosystem credits and species credits) that measure potential impacts of the development on biodiversity values. This calculation will inform the decision maker (Wingecarribee Shire Council) as to the number and class of offset credits required to be purchased and retired as a result of the proposed development.

# 2. Methodology

## 2.1 IBRA Bioregions and Subregions

The Subject Land occurs within the 'Sydney Basin' Interim Biogeographic Regionalisation (IBRA) 7 for Australia, specifically occurring within the 'Moss Vale' IBRA 7 Subregion **(Table 1; Figure 3).**

## 2.2 Mitchell Landscapes

NSW Landscapes Mapping: Background and Methodology (Mitchell 2002) groups ecosystems into meso-ecosystems representing larger natural entities based on topography and geology. The naming of ecosystems and meso-ecosystems was standardised so that each name provided location information and a meaningful descriptive landscape term. One Mitchell Landscape Ecosystems is situated within the Subject Land: Moss Vale Highlands Mitchell Landscape Ecosystem **(Table 1**; **Figure 4)**.

**Table 1. IBRA Bioregions, Subregions and NSW Mitchell Landscapes**

| IBRA Bioregion | IBRA Subregion | NSW Mitchell Landscape Ecosystem |
|---|---|---|
| Sydney Basin | SYB11- Moss Vale | Moss Vale Highlands |

### 2.2.1 NSW Mitchell Landscape Ecosystems: Moss Vale Highlands

Rolling hills and rounded peaks with deep channel incision on horizontal Triassic alternating quartz sandstone and shale, general elevation 700 to 850mm, local relief 80m. Widespread yellow and grey texture-contrast soils, deep yellow earth on friable sandstone often with concretionary ironstone and accumulations of clan quartz sand in valleys. Woodland of Silvertop Ash (*Eucalyptus sieberi*), Sydney Peppermint (*Eucalyptus piperita*), Smooth-barked Apple (*Angophora costata*), Blue-leaved Stringybark (*Eucalyptus agglomerata*) and Scribbly Gum (*Eucalyptus haemastoma*) on sheltered sites. Open forest in gullies at the head of rivers below the plateau; Gully Gum (*Eucalyptus smithii*), River Peppermint (*Eucalyptus elata*), Mountain Grey Gum (*Eucalyptus cypellocarpa*). Woodland of; mountain grey gum, Coastal White Box (*Eucalyptus quadrangulata*), White Stringybark (*Eucalyptus globoidea),* Swamp Gum (*Eucalyptus ovata*), and Cabbage Gum (*Eucalyptus amplifolia*) on shale and poorly drained sites. Large areas of wet heath with; Prickly Broom Heath (*Monotoca scoparia*), Coral Heath (*Epacris microphylla),* Christmas Bells (*Blandfordia nobilis*) and Button Grass (*Gymnoschoenus sphaerocephalus*) with patches of; stunted Silvertop Ash, Red Bloodwood (*Corymbia gummifera*), and Scrub She-oak (*Allocasuarina paludosa*) (Mitchell 2002).

## 2.3 Landscape Features

### 2.3.1 Geology and Soils

Three (3) soil landscapes are mapped as occurring within the Subject Land (Department of Environment and Climate Change 2009):

- Lower Mittagong
- Moss Vale
- Kangaloon

#### 2.3.1.1 Lower Mittagong

The Lower Mittagong soil landscape is characterised by rises and low hills on Wianamatta Group Shale in the Moss Vale Tablelands, Wanganderry Tablelands and Woronora Plateau. Local relief 5-90m; altitude 534-820m; slopes 0-25%; rock outcrop nil. Extensively cleared open forest. Soils are comprised of Brown Kurosols (Yellow and Brown Podzolic Soils), Red Kurosols (red Podzolic Soils), Brown Dermosols (Yellow Earths) and Red and Brown Kandosols (Red Earths and Brown Earths), with Yellow Natric Kurosols (Soloths) in drainage lines.

#### 2.3.1.2 Moss Vale

The Moss Vale soil landscape is characterised by rises on Wianamatta Group Shale in the Moss Vale Tablelands and Woronora Plateau. Local relief 5-30m; altitude 544-740m; slopes 0-5%; rock outcrop nil. Extensively cleared open forest. Soils are comprised of Yellow Kurosols (Yellow Podzolic Soils), Red Kurosols (Red Podzolic Soils), Brown Kurosols (Yellow Podzolic Soils) and Yellow Kandosols (Yellow Earths).

#### 2.3.1.3 Kangaloon

Foot slopes within plain on Wianamatta Group Shale (alluvium, colluvium and shale) in the Moss Vale Tablelands and Woronora Plateau. Local relief 0-9 m; altitude 531-745 m; slopes 1-3%; rock outcrop nil. Extensively cleared open grassland. Soils comprised of Brown Kurosols (Yellow Podzolic Soils) and Hydrosols (Humic Gleys).

### 2.3.2 Hydrology

A dam and first order watercourse are located along the southern boundary of the Subject Land (NSW Government Spatial Services 2019).

**Table 2. Landscape features identified within the Subject Land and surrounding 1500m buffer.**

| Landscape Feature | Identification of Landscape Feature with the Subject Property |
|---|---|
| **Native vegetation extent in 1500m buffer area** | The circular 1500m buffer zone covers an area of approximately 929 ha. Within this circle native vegetation covers approximately 726 ha. This area of native vegetation represents approximately 78% of the 1500m buffer zone. The native vegetation cover observed therefore results in the assessment area being assigned to the >70% cover class (**Figure 7**). |
| **Cleared area within 1500m buffer** | The total area of cleared land within the assessment area surrounding the Subject Land is approximately 203 ha. This area of cleared land accounts for approximately 22% of the land within the 1500m buffer zone (**Figure 7**). |
| **Rivers and Streams (classified according to stream order)** | A number of mapped watercourses occur within the 1500m buffer of the Subject Land (**Figure 5**). The watercourses range from 1st order streams to 3nd order streams. One first order unnamed tributary of Reedy Creek and a dam runs along the southern boundary of the Subject Property (**Figure 6**). |
| **Wetlands (within, adjacent to and downstream of site)** | The Subject Land and the immediate surrounds (within the 1500m buffer) do not contain any areas of native vegetation identified as 'Coastal Wetlands' as per the State Environmental Planning Policy (Coastal Management) 2018. |
| **Connectivity features** | The identified area of habitat connectivity between the Subject Land and native vegetation within the 1500m buffer zone has the potential to provide habitat for a number of threatened species, endangered populations and migratory species (**Figure 7**). There is the potential that 'flyways' used by a suite of both terrestrial and migratory avian species encompass the Subject Land as well as a land within the 1500m buffer zone. The Subject Land is in close proximity to Morton National Park. |
| **Areas of geological significance and soil hazard features** | No areas of geological significance (karsts, caves, crevices or cliffs) were identified within the Subject Land. This was determined as a result of a comprehensive site-based assessment. The Subject Land and immediate surrounds (within the 1500m buffer) are not mapped as occurring on Acid Sulphate Soils nor mapped as having risk/ probability of exhibiting occurrence of Acid Sulphate Soils. This risk is therefore not applicable to the proposed activity. |

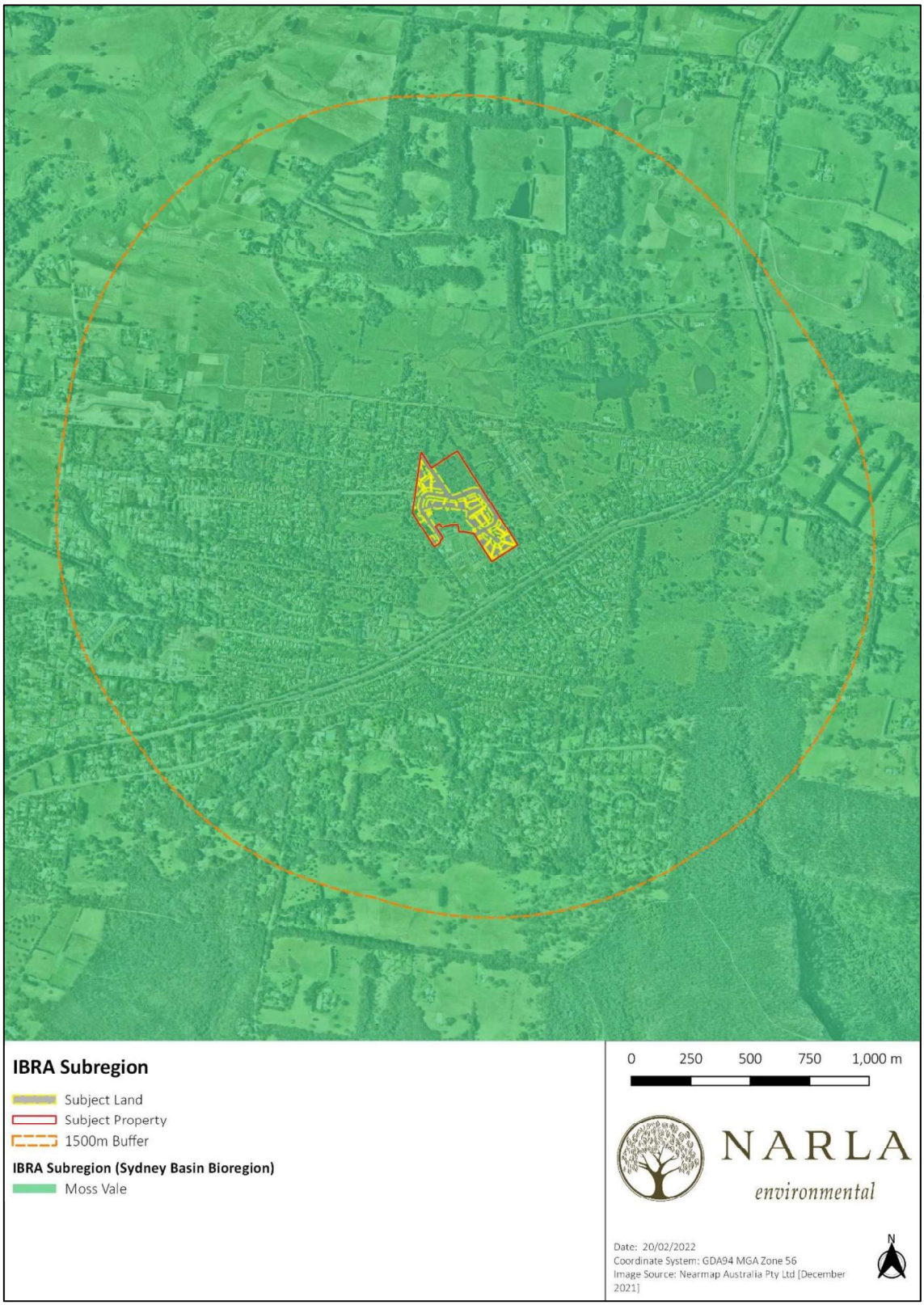


Figure 3. IBRA Bioregion and Subregion of the Subject Property, and within a 1500m buffer.

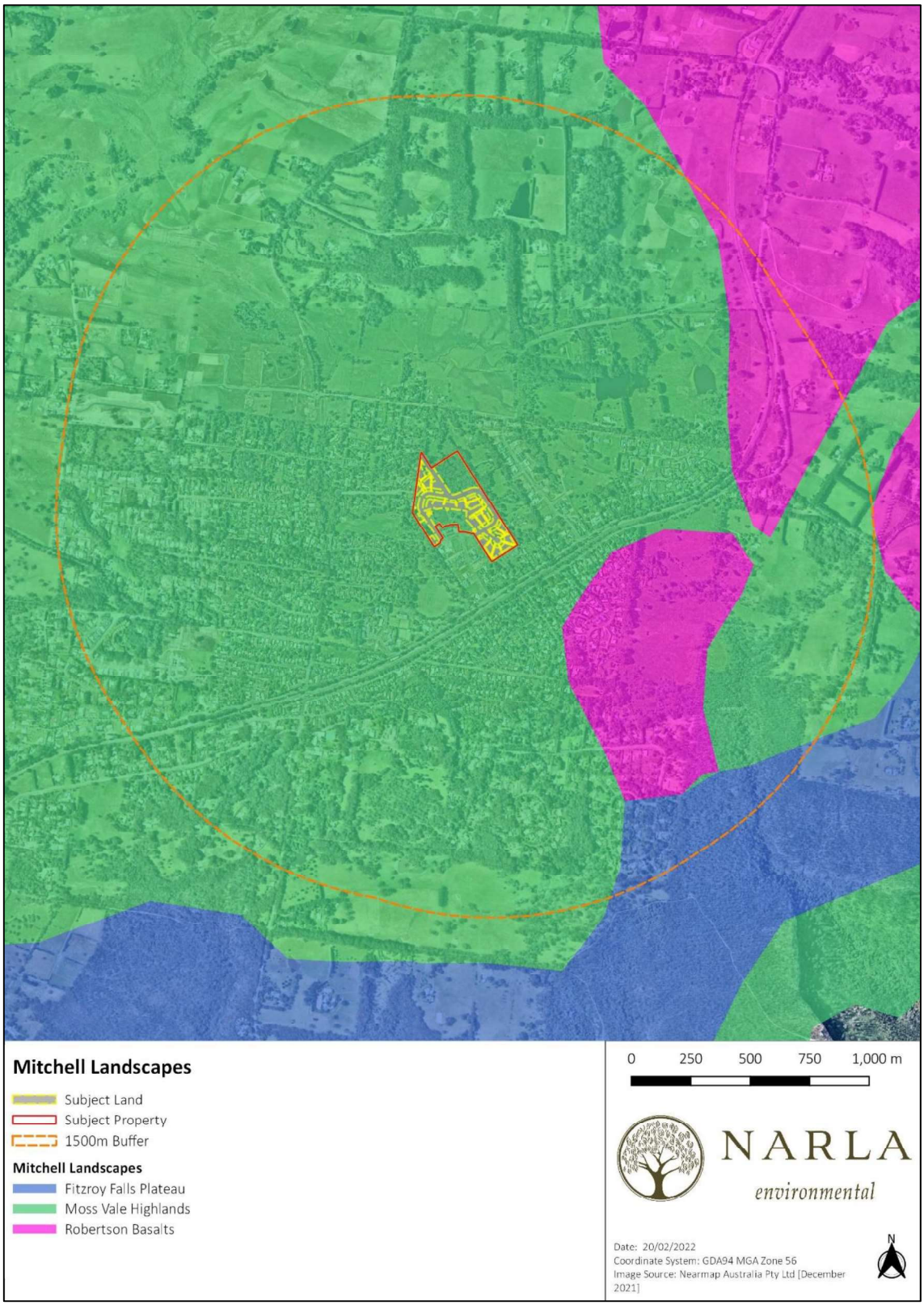


Figure 4. NSW Mitchell Landscape Ecosystem of the Subject Property and within a 1500m buffer.

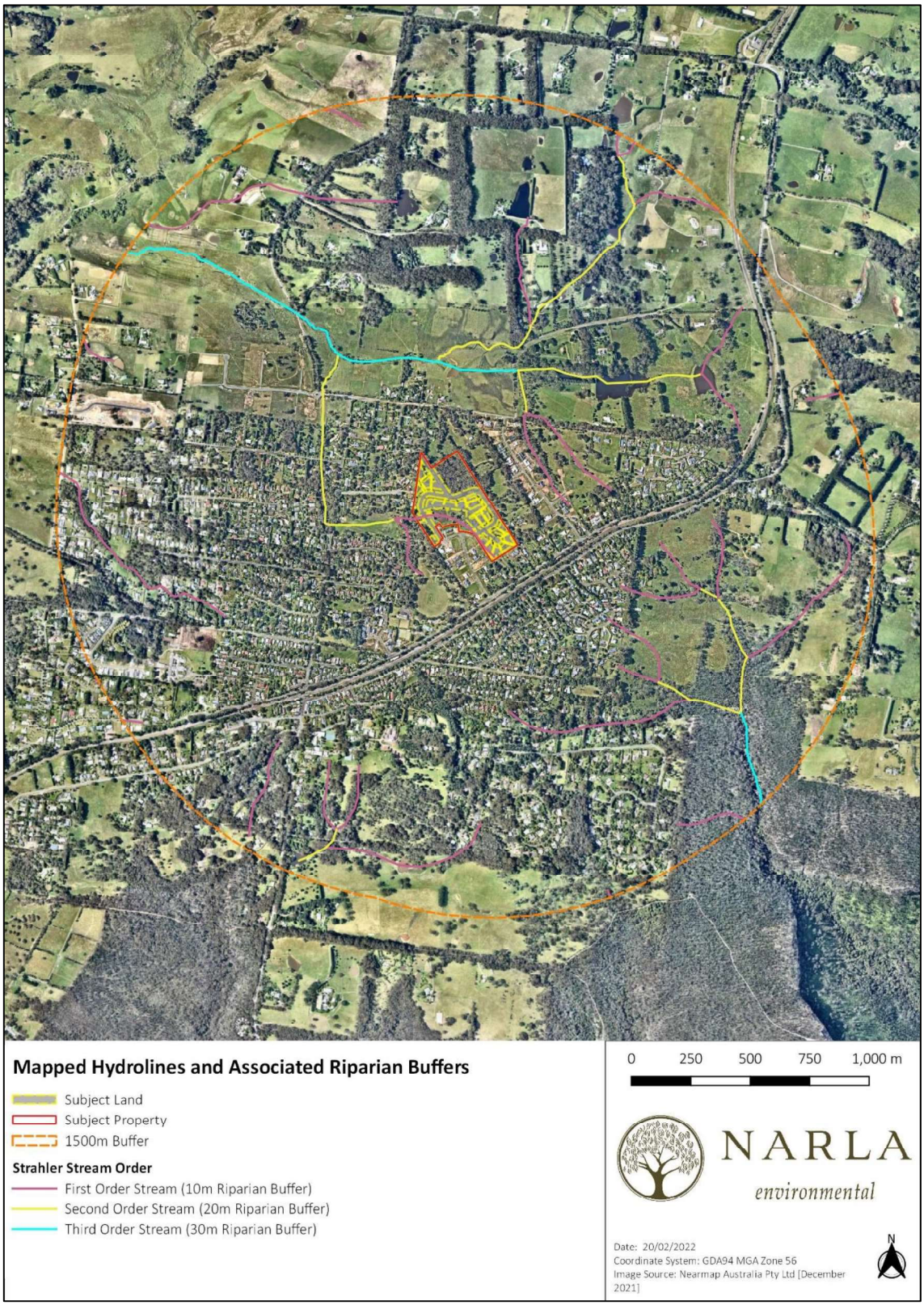


Figure 5. Rivers, streams, estuaries and riparian buffer zones occurring within the 1500m buffer.


Figure 6. First order stream within the Subject Property

# 3. Native Vegetation

## 3.1 Assessing Native Vegetation Cover and Connectivity

Native vegetation cover and connectivity have been assessed in accordance with Section 3.2 of the BAM (DPIE 2020a). The native vegetation cover will be used to assess the habitat suitability of the Subject Land for threatened species. Areas of connectivity will determine the extent of habitat that may facilitate the movement of threatened species across their range.

A buffer area of 1500m surrounding the outside edge of the boundary of the Subject Land was prepared in order to determine the extent of native vegetation within the surrounding locality. Native vegetation was considered to cover approximately 726 ha within the buffer circle and was assigned the >70% class (**Figure 7**).

Large areas of connectivity that may facilitate the movement of threatened species were evident within the 1500m surrounding the Subject Land. This included large vegetated areas to the north and east of the Subject Land, and smaller pockets to the west (**Figure 7**).

## 3.2 Assessing Patch Size

Patch size is defined by the BAM (DPIE 2020a) as:

- An area of native vegetation that occurs on the subject land and includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤ 30 m for non-woody ecosystems). A patch may extend onto adjoining land.

Patch size was calculated according to the above guidelines, and equated to >100 ha.


Figure 7. The extent of native vegetation and habitat connectivity occurring within and surrounding the 1500m buffer.

## 3.3 Historically Mapped Vegetation Communities

The 'Native Vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands' (Tozer et al 2010), indicated the presence of one (1) vegetation community on the Subject Land: 'Southern Highlands Shale Woodland' (**Figure 8**). Southern Highlands Shale Woodland is listed as a Critically Endangered Ecological Community under the NSW BC Act 2016 and the Commonwealth EPBC Act 1999.

A detailed description of the historically mapped community is provided in **Table 3**.

**Table 3. Description of the historically mapped vegetation within the Subject Land**

| Southern Highland Shale Woodland | | |
|---|---|---|
| **Description of Vegetation Community** | | |
| Southern Highlands Shale Woodland (WSF p268) was identified by Tindall *et al.* (2004) as WSF 268. This unit is a eucalypt open forest or woodland with a sparse shrub stratum and a dense groundcover dominated by grasses and herbs. This unit occurs on the Southern Highlands plateau from Mittagong to Bundanoon where it is restricted to soils derived from Wianamatta group shales with an average annual rainfall below 1300mm. In higher rainfall areas east of Wingecarribee reservoir, Southern Highlands Shale Woodland is replaced by Shale-Basalt Sheltered Forest (WSF p168). On localised outcrops of residual shale on sandstone plateaux to the northeast this unit is replaced by Nepean Shale Cap Forest (WSF p68). Occupying rich clay soils on flat land, this unit has been extensively cleared for agriculture, leaving relatively few small remnants, many of which are degraded and are threatened by continued clearing, grazing and weed invasion. | | |
| **Characteristic canopy species:** | **Characteristic shrub species:** | **Characteristic groundcover species:** |
| *Eucalyptus cypellocarpa*<br>*Eucalyptus radiata*<br>*Eucalyptus quadrangulata*<br>*Eucalyptus globoidea* | *Leucopogon lanceolatus*<br>*Ozothamnus diosmifolius*<br>*Persoonia linearis* | *Hardenbergia violacea*<br>*Lomandra longifolia*<br>*Lomandra multiflora*<br>*Microlaena stipoides var. stipoides*<br>*Austrostipa rudis ssp. Nervosa*<br>*Dichondra spp.*<br>*Gonocarpus tetragynus*<br>*Pteridium esculentum*<br>*Opercularia diphylla* |
| **Distribution within Region:** | Occurs on the Southern Highlands plateau from Mittagong to Bundanoon where it is restricted to soils derived from Wianamatta group shales with an average annual rainfall below 1300mm. | |
| **Scientific Reference** | Tozer, M.G., Turner, K., Keith, D.A., Tindall, D., Pennay, C., Simpson, C., MacKenzie, B., Beukers, M. and Cox, S. (2010) Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Cunninghamia 11(3): 359-406;<br><br>NSW Scientific Committee. (2011) Southern Highland Shale Woodland in the Sydney Basin Bioregion - Final Determination | |

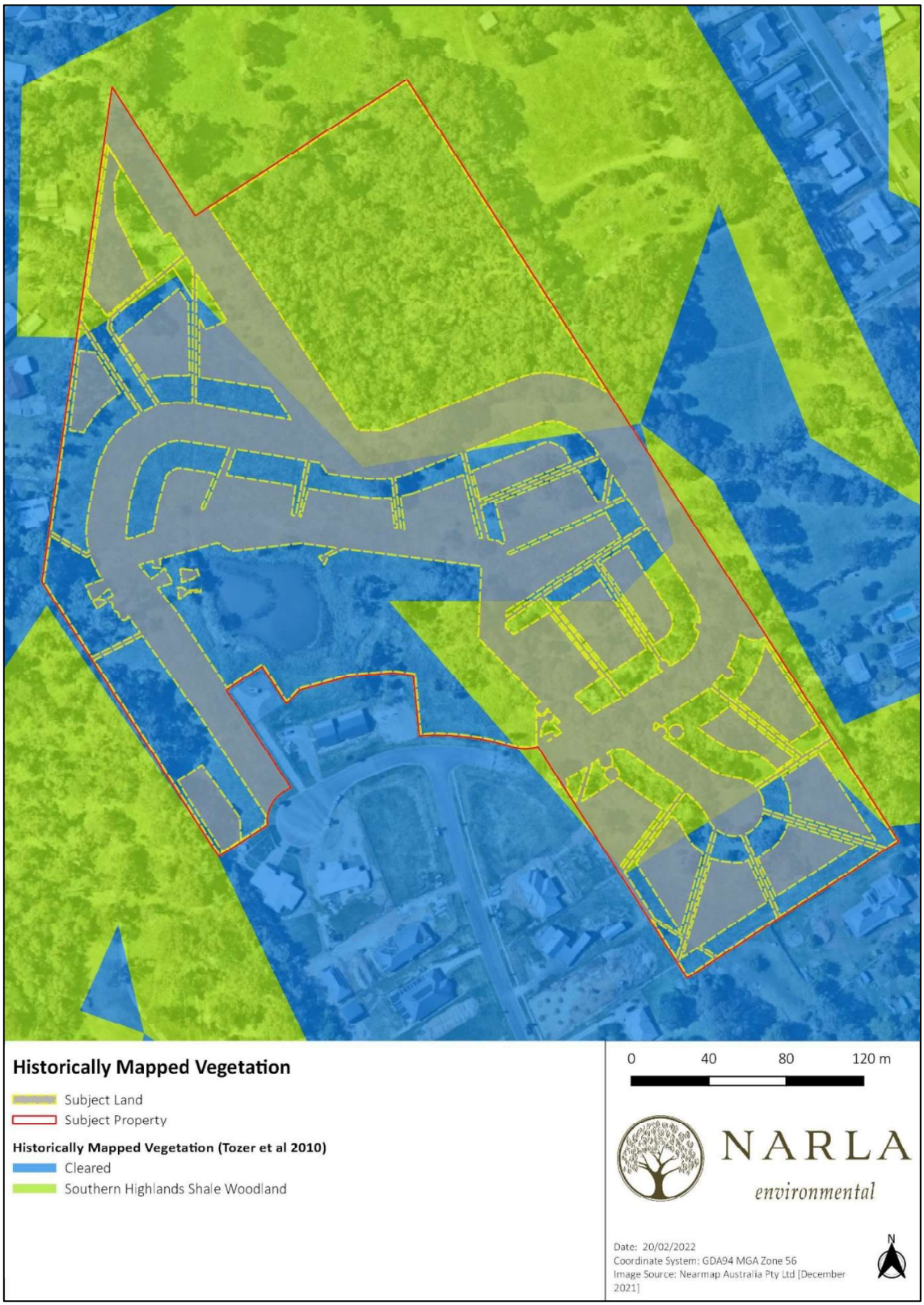


Figure 8. Historically mapped vegetation within the Subject Property (Tozer et al. 2010).

## 3.4 Plant Community Types (PCT) Identified within Subject Land

### 3.4.1 PCT Selection Process

Field surveys conducted by Narla confirmed that one (1) native vegetation community was located within the Subject Land in two (2) condition classes. Plant Community Type selection for this vegetation community was undertaken using information and databases provided in the BioNet Vegetation Classification System (DPIE 2022e). The following selection criteria were selected to develop the PCT shortlist:

- **IBRA Bioregion:** Sydney Basin
- **IBRA Subregion:** Moss Vale
- **County:** Wingecarribee
- **Dominant Upper Stratum Species:** *Eucalyptus radiata, Eucalyptus cypellocarpa* and *Eucalyptus globoidea*

This process delivered a selection of three (3) PCT's that could potentially occur within the Subject Land. The steps taken to justify the presence or absence of each of these PCT's within the Subject Land is provided in **Table 4.**

Table 4. PCT Selection Criteria

| Candidate PCT | Characteristic Canopy | Characteristic Shrub / Groundcover | Landscape Position / Geology | Justification |
|---|---|---|---|---|
| PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion | *Eucalyptus cypellocarpa; Eucalyptus radiata subsp. radiata; Eucalyptus quadrangulata; Eucalyptus globoidea;* | *Leucopogon lanceolatus; Ozothamnus diosmifolius; Persoonia linearis; Austrostipa rudis subsp. nervosa; Gonocarpus tetragynus; Hardenbergia violacea; Lomandra longifolia; Microlaena stipoides var. stipoides; Opercularia diphylla; Pteridium esculentum; Lomandra multiflora;* | Open forest or woodland with sparse shrub layer and grassy ground cover. Restricted to soils derived from Wianamatta group shales with an average annual rainfall below 1300mm. Occurs on the Southern Highlands plateau from Mittagong to Bundanoon | Narla have assigned this PCT to the vegetation within the Subject Land. This PCT was chosen due to the occurrence of characteristic species, The Study Area also occurs on a plateau in the Bundanoon region on soils that are derived from the Wianamatta group shales. Further justification is outlined in **Table 5.** |
| PCT 1107: River Peppermint – Narrow-leaved Peppermint open forest on sheltered escarpment slopes, Sydney Basin Bioregion and South East Corner Bioregion. | *Eucalyptus elata; Eucalyptus radiata subsp. radiata; Eucalyptus fastigata; Eucalyptus cypellocarpa; Eucalyptus viminalis; Eucalyptus dalrympleana subsp. dalrympleana;* | *Clematis aristata; Leucopogon lanceolatus; Rubus parvifolius; Desmodium varians; Dianella caerulea; Dichondra repens; Echinopogon ovatus; Glycine clandestina; Lomandra longifolia; Microlaena stipoides var. stipoides; Plantago debilis; Poranthera microphylla; Pteridium esculentum; Stellaria pungens; Veronica plebeia;* | Tall open forest with an open shrub layer and moist herbaceous groundcover. Occurs on sheltered slopes on high ranges of the escarpment, mainly between 600 and 1100m, from the western Blue Mountains to Deua National Park. | Despite having some characteristic vegetation that were found within the Subject Land. The Subject land was not located on the high ranges of an escarpment therefore PCT 1107 was not the best fit for the vegetation community found within the Subject Land. |

| Candidate PCT | Characteristic Canopy | Characteristic Shrub / Groundcover | Landscape Position / Geology | Justification |
|---|---|---|---|---|
| PCT 1254: Sydney Peppermint – White Stringybark moist shrubby forest on elevated ridges, Sydney Basin Bioregion | *Eucalyptus piperita;*<br>*Eucalyptus globoidea;*<br>*Eucalyptus cypellocarpa;*<br>*Eucalyptus obliqua;*<br>*Eucalyptus smithii;* | *Clematis aristata;*<br>*Eustrephus latifolius;*<br>*Goodenia ovata;*<br>*Indigofera australis;*<br>*Leucopogon lanceolatus;*<br>*Notelaea venosa;*<br>*Polyscias sambucifolia subsp. A;*<br>*Adiantum aethiopicum;*<br>*Blechnum cartilagineum;*<br>*Dianella caerulea;*<br>*Dichondra repens;*<br>*Doodia aspera;*<br>*Glycine clandestina;*<br>*Lomandra longifolia;*<br>*Microlaena stipoides var. stipoides;*<br>*Pratia purpurascens;*<br>*Pteridium esculentum;*<br>*Smilax australis;*<br>*Tylophora barbata;*<br>*Hydrocotyle peduncularis;* | Tall open forest with an open shrub layer and moist herbaceous groundcover. Occurs on shale and the shale/basalt boundary at altitudes between 450 and 900m in the Blue Mountains and Southern Highlands. | Despite having some characteristic vegetation that were found within the Subject Land. The Subject land was not located on a shale and shale/basalt boundary and therefore it was deemed that PCT 1254 was not the best fit for the vegetation community found within the Subject Land. |

### 3.4.2 Final PCT Selection

One (1) vegetation community, in two (2) condition zones was identified within the Subject Land:

- PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion.
    - Zone 1: PCT 944 - Canopy condition; and
    - Zone 2: PCT 944 - Grassland condition

This vegetation zone is detailed in **Table 5.**

**Table 5. PCTs identified within the proposed Subject Land**

| **PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Zone 1: Canopy condition).** | |
|---|---|
|  | |
| **Vegetation formation / Keith Class** | Wet Sclerophyll Forests (Grassy sub-formation)/Southern Tablelands Wet Sclerophyll Forests |
| **Description in VIS** | |
| Other Diagnostics Features: Open forest or woodland with sparse shrub layer and grassy ground cover. Restricted to soils derived from Wianamatta group shales with an average annual rainfall below 1300mm.; Landscape Position: Occurs on the Southern Highlands plateau from Mittagong to Bundanoon. | |
| **Condition class on Subject Land** | Canopy Condition (canopy trees present) |
| **Extent within Subject Land (approximate)** | 2.12ha |

| PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Zone 1: Canopy condition). | |
|---|---|
| **Survey effort** | Two (2) VIS plots were established. |
| **Description of the Vegetation on Study Area** | |
| This vegetation community within the Subject Land contained low-moderate native species diversity. Canopy species that existed within this zone included *Eucalyptus radiata, Eucalyptus globoidea* and *Eucalyptus cypellocarpa.* The mid-storey and ground layer stratums appeared to be altered by historical clearing or under scrubbing, with low overall coverage present. Mid-strata native species included *Bursaria spinosa, Daviesia ulicifolia, Acacia stricta* and *Podolobium ilicifolium.* The groundlayer was dominated by *Lomandra filiformis, Microlaena stipoides* and *Rytidosperma spp.* | |
| **Structure of Vegetation** | |
| Within the 20m x 20m plot, a moderate coverage of native trees occurred, at 77.5% cover. The shrub layer was quite sparse at 1.6%, most likely due to historical thinning. The ground layer was sparsely covered, which included.34% cover of native grass/ grass-like species, 0.3% native forb and 1.5% native fern. A dense layer of leaf litter (72.5% cover) was also recorded within the plots. | |
| **Scientific Reference from VIS (DPIE 2022e)** | Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., 2010. Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0; |
| **TEC Status (BC Act 2016 and EPBC Act 1999)** | This vegetation in this PCT forms part of Southern Highland Shale Woodland which is an Endangered Ecological Community under the BC Act 2016.<br><br>The vegetation within this PCT conforms to the EPBC Act Listed Southern Highlands Shale Forest and Woodland in the Sydney Basin which is a Critically Endangered Ecological Community. |
| **Estimate of percent cleared value of PCT in the major catchment area** | 84.00 % |

| PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Zone 2: Grassland condition). | |
|---|---|
|  | |
| **Vegetation formation / Keith Class** | Wet Sclerophyll Forests (Grassy sub-formation)/Southern Tablelands Wet Sclerophyll Forests |
| **Description in VIS** | |
| Other Diagnostics Features: Open forest or woodland with sparse shrub layer and grassy ground cover. Restricted to soils derived from Wianamatta group shales with an average annual rainfall below 1300mm.; Landscape Position: Occurs on the Southern Highlands plateau from Mittagong to Bundanoon. | |
| **Condition class on Subject Land** | Grassland Condition (trees and shrubs absent) |
| **Extent within Subject Land (approximate)** | 2.88ha |
| **Survey effort** | Two (2) VIS plots were established. |
| **Description of the Vegetation on Study Area** | |
| This vegetation community within the Subject Land was typical of a historically cleared landscape with no trees or shrubs present. The groundlayer was comprised of regenerating native grasses and groundcovers and exotic agricultural vegetation. | |
| **Structure of Vegetation** | |
| Within the 20m x 20m plot, the tree and shrub layers were absent due to historical clearing. The ground layer was sparsely covered, which included 22.1% cover of native grass/ grass-like species, 0.1% native forb and 17.5% native fern. A moderate layer of leaf litter (37.5% cover) was also recorded within the plots. | |

| PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Zone 2: Grassland condition). | |
|---|---|
| **Scientific Reference from VIS (DPIE 2020e)** | Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C., 2010. Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. Version 1.0; |
| **TEC Status (BC Act 2016 and EPBC Act 1999)** | This PCT forms part of Southern Highland Shale Woodland which is a Critically Endangered Ecological Community under the BC Act 2016.<br><br>The vegetation within this zone does **not** conform to the EPBC listing for the Southern Highlands Shale Forest and Woodland in the Sydney Basin Bioregion. |
| **Estimate of percent cleared value of PCT in the major catchment area** | 84.00 % |

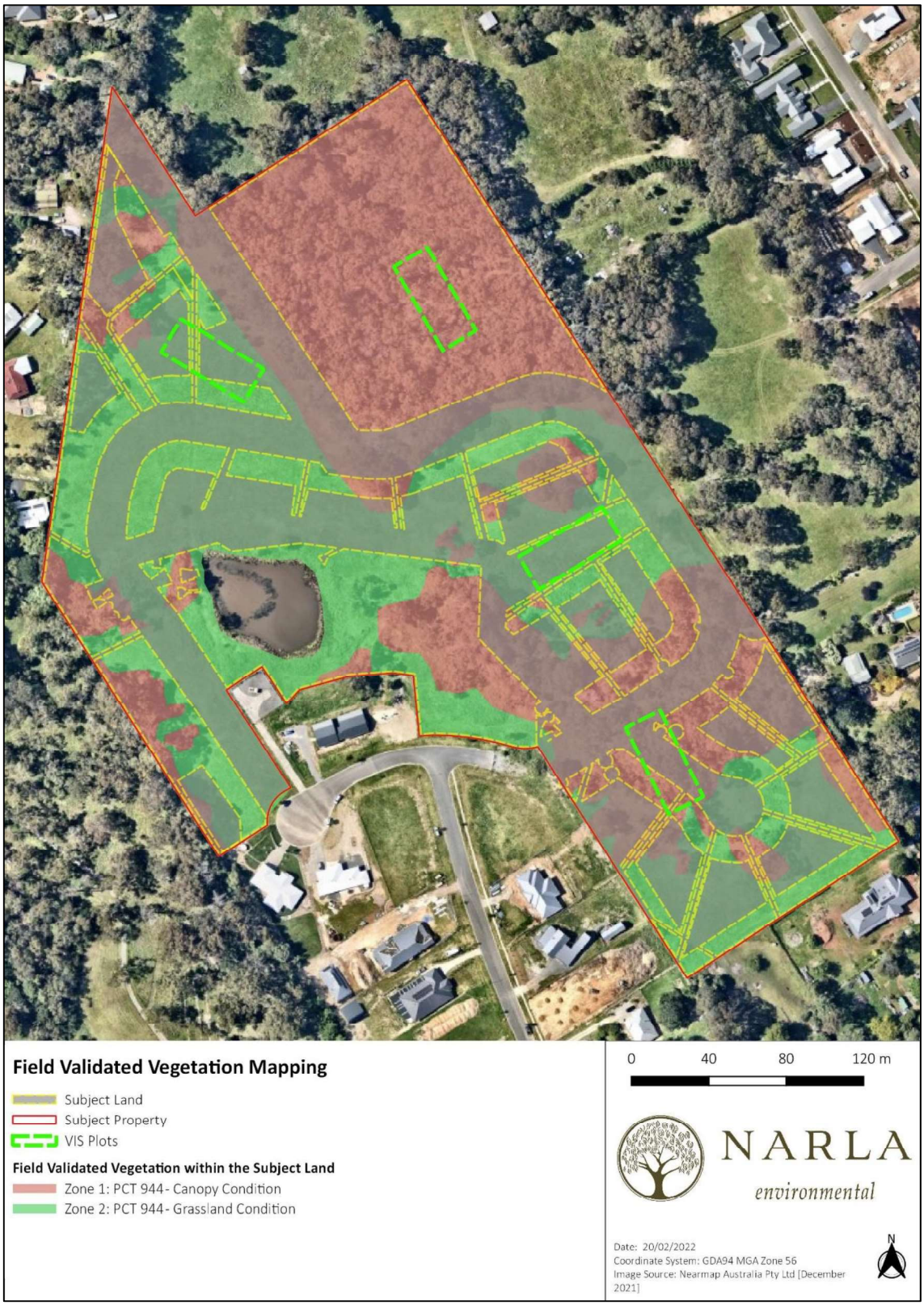


Figure 9. Narla field validated vegetation mapping and locations of BAM plots within the Subject Land

## 3.5 Threatened Ecological Communities

### 3.5.1 Biodiversity Conservation Act 2016

The native vegetation within the Subject Land conforms to the BC Act listed Southern Highlands Shale Woodlands in the Sydney Basin Bioregion (SHSW; **Figure 10**). This was determined by a comprehensive desktop assessment that identified the typical SHSW landscape attributes within the Subject Land, in conjunction with a site visit that found a suite of characteristic SHSW species. Vegetation Zone 2 is also found to conform to the BC Act listing as the Final Determination States (NSW Scientific Committee 2011):

- Disturbed Southern Highlands Shale Woodlands remnants are considered to form part of the community including areas where the vegetation would respond to assisted natural regeneration, such as where the natural soil and associated seedbank is still at least partially intact.

### 3.5.2 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

The native vegetation within the Subject Land within Zone 1 conforms to the EPBC Act 1999 listed CEEC Southern Highlands Shale Forest and Woodland of the Sydney Basin Bioregion. Zone 1 meets all of the key diagnostic characteristics as outlined in **Table 6**, and meets all the condition thresholds for Category A2 patches as outlined in **Table 7**, and therefore conforms to the CEEC.

The vegetation within Zone 2 does not meet the EPBC listed community as vegetation derived from grasslands and shrublands are not included as part of the nationally listed CEEC.

**Table 6. Key Diagnostics Characteristics required to meet the EPBC Listing Status for C Southern Highlands Shale Forest and Woodland (Threatened Species Scientific Committee 2015).**

| Key Diagnostic Characteristic | Criteria met? (Vegetation Zone 1) |
|---|---|
| Is an open forest or woodland with a canopy dominate by one of more eucalypt species listed in Table 1 of the conservation advice. | Yes. Vegetation Zone 1 is an open forest or woodland and has numerous eucalypt species listed in Table 1 of the Conservation Advice. |
| Has a ground layer including native grasses and/or other herbs | Yes. Vegetation Zone 1 had a ground layer comprised of native grasses and forbs. |
| Occurs in the Southern Highlands in the Sydney Basin Bioregion (IBRA v7). | Yes. The Subject Land is located within the Southern Highlands in the Sydney Basin Bioregion. |
| Occurs at elevations between 470 m – 830 m ASL on clay soils derived from Wianamatta shale. | Yes |

**Table 7. Condition Thresholds for patches that meet the description for Southern Highlands Shale Forest and Woodland ecological community**

| Category and rationale | Threshold | Threshold Met? |
|---|---|---|
| A1. High Condition Class:<br>A larger patch with good quality native understorey | Minimum patch size is ≥2ha;<br>**AND**<br>≥50% of the perennial understorey vegetation cover is made up of native species.<br>**OR**<br>≥30 native species per ha | No |
| | | Yes |
| **OR** | | |
| A2. High Condition Class:<br>A patch with good quality native understorey | The patch size is ≥0.5ha;<br>**AND**<br>≥70% of the perennial understorey vegetation is made up of native species. | Yes |
| | | Yes |
| The vegetation within Zone 1 within the Subject Land **does** conform to the EPBC listed Southern Highlands Shale Forest and Woodland ecological community – Category A2 | | |

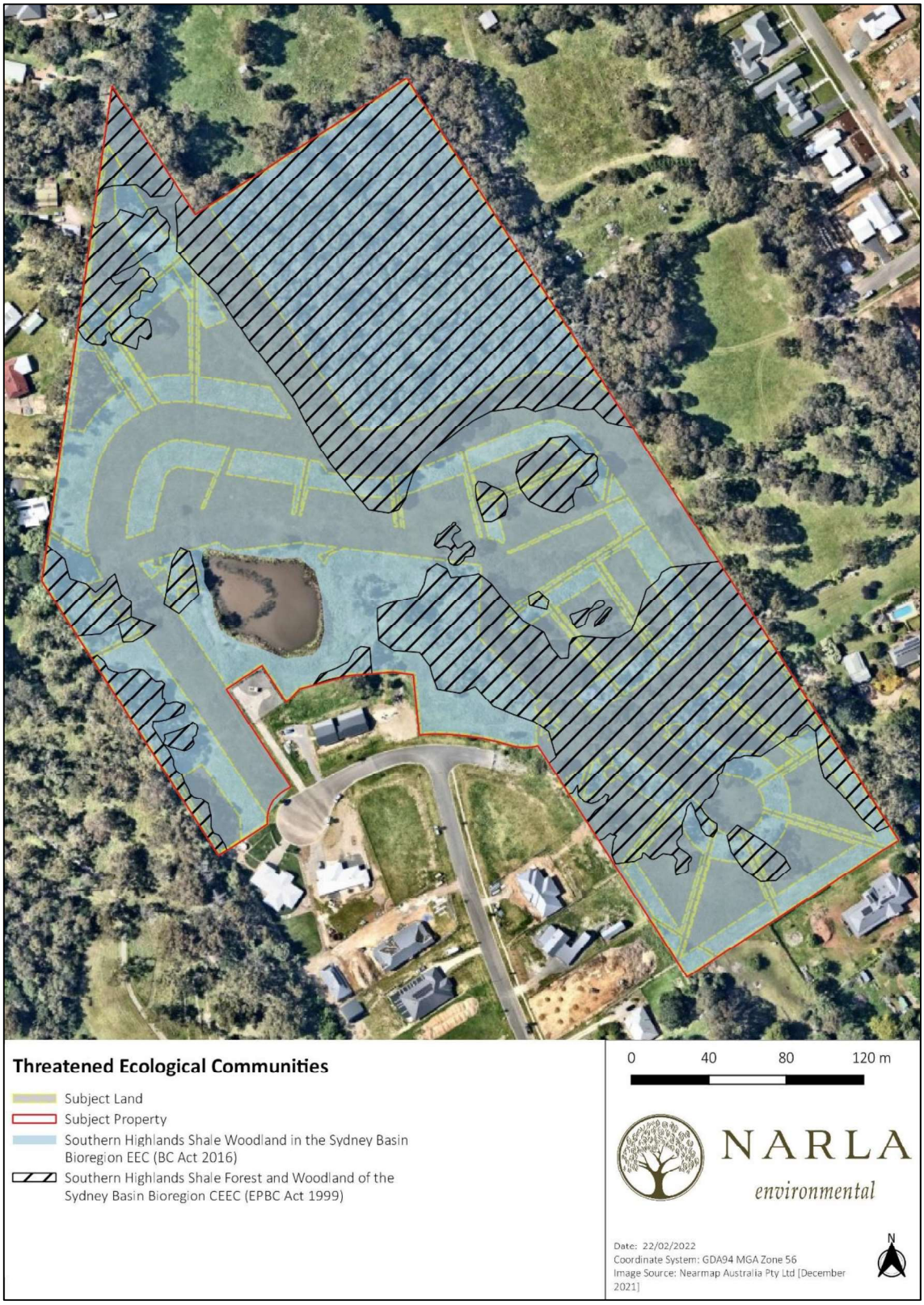


Figure 10. Threatened Ecological Communities located within and surrounding the Subject Land.

## 3.6 Vegetation Integrity Survey (VIS) Plots

Four (4) Biodiversity Assessment Method (BAM) Vegetation Integrity Survey (VIS) Plots were undertaken within the Subject Land. Plot data gathered for each attribute used to assess the function of the Subject Land vegetation is detailed in **Appendix C.** Vegetation Integrity Scores (VIS) represented by existing vegetation within each vegetation zone is detailed in **Table 8.**

**Table 8. Vegetation integrity scores for each identified zone.**

| PCT | Vegetation Zone | Management Zone | Area (ha) | Survey Effort | Composition Condition Score | Structure Condition Score | Function Condition Score | VI Score | Future VI Score | Change in VI Score | Total change in VI score | Hollow bearing trees |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PCT 994: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion | Zone 1 (Canopy) | 1a – Complete Removal | 1.63 | Two 1000m$^2$ (20m x 50m) Vegetation Integrity Survey Plot | 28.7 | 46.8 | 99.9 | 51.2 | 0 | -51.2 | -50.3 | Present |
| | | 1b - IPA | 0.38 | | | | | | 5.1 | -46.1 | | |
| | | 1c - OPA | 0.11 | | | | | | 7.8 | -43.4 | | |
| | Zone 2 (Grassland) | Complete Removal | 2.88 | Two 1000m$^2$ (20m x 50m) Vegetation Integrity Survey Plot | 11.2 | 25.4 | 9.2 | 13.8 | 0 | -13.8 | -13.8 | Absent |

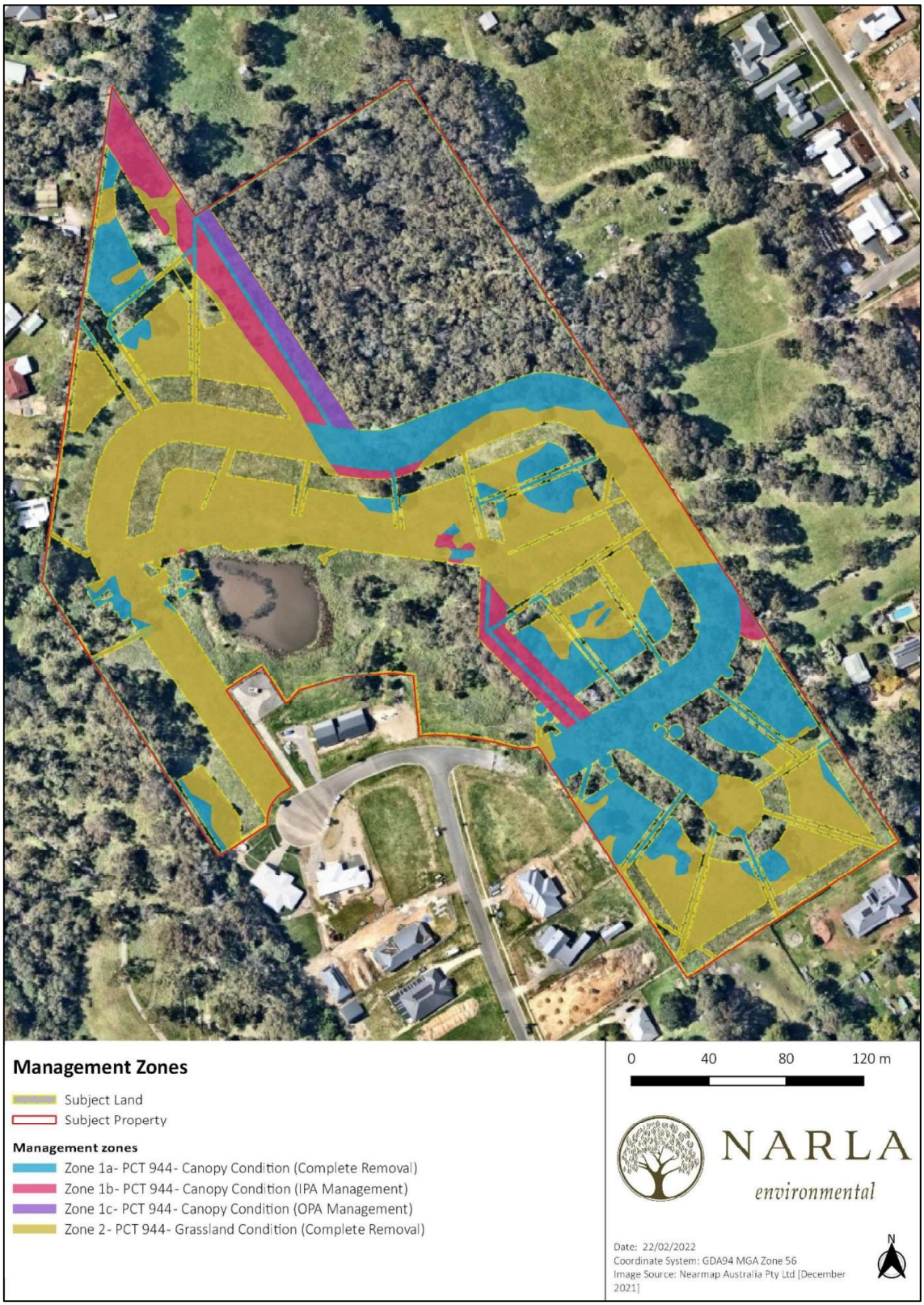


Figure 11. Vegetation impact management zones within the Subject Land.

### 3.6.1 Determining Future vegetation integrity scores

Most projects will result in complete clearing of vegetation and threatened species habitat within the development footprint. In this scenario, the assessor must assess the proposed future value of each of the VI attributes as zero in the BAMC. However, in circumstances where partial clearing of vegetation is proposed and remaining vegetation will be maintained (i.e. not degraded further over time), the assessor may determine that the future value of the relevant VI attributes are greater than zero (DPIE 2020a).

The Subject Land will be exposed to varying degrees of clearing due to the location of the proposed building envelopes and other infrastructure as well the requirement for associated APZs (IPA and OPA). Subsequently, each vegetation zone within the Subject Land has been divided into the following management zones to account for the varying clearing levels **(Figure 11)**. The attributes influencing future vegetation scores are detailed in **Table 9.**

**Table 9. Management Zones within the Subject Land, and the relevant vegetation attributes (composition, structure and function) affecting future VI scores**

| Management Zone | Changes in current vegetation attributes | Vegetation attributes not changed |
|---|---|---|
| **Zone 1a: PCT 944 Canopy Condition (Complete Removal)** | All vegetation will be removed | |
| **Zone 1b: PCT 944 Canopy Condition (IPA maintenance)** | Canopy cover reduced to 14.9%<br>All grass, fern and other cover removed.<br>Removal of all leaf litter and coarse woody debris.<br>Removal of regenerating stems <5cm DBH.<br>High Threat Exotic (HTE) cover reduced to zero through the implementation of a VMP.<br>Canopy stem size classes changed to zero, using precautionary principle.<br>Large trees changed to zero (0) using precautionary principle. | Species composition for trees and shrubs<br>Shrub cover percentage |
| **Zone 1c: PCT 944 Canopy Condition (OPA maintenance)** | Canopy cover reduced to 30%<br>All grass, fern and other cover removed.<br>Removal of all leaf litter and coarse woody debris.<br>Removal of regenerating stems <5cm DBH.<br>High Threat Exotic (HTE) cover reduced to zero through the implementation of a VMP.<br>Canopy stem size classes changed to zero, using precautionary principle.<br>Large trees changed to zero (0) using precautionary principle. | Species composition for trees and shrubs<br>Shrub cover percentage |
| **Zone 2: PCT 944 Grassland Condition (Complete Removal)** | All vegetation will be removed | |

# 4. Threatened Species

## 4.1 Candidate Ecosystem Credit Species

Ecosystem credit species associated with the Subject Land are listed below in **Table 10.** Two (2) species predicted by the BAM calculator as potential ecosystem credits were excluded from zone 2 based on suitable habitat not being present as outlined in the Threatened Biodiversity Database (DPIE 2020).

**Table 10. Candidate ecosystem credits predicted to occur within the Subject Land.**

| Scientific Name | BC Act Status | Excluded from assessment? Vegetation Zones | |
|---|---|---|---|
| | | Zone 1 | Zone 2 |
| *Artamus cyanopterus cyanopterus* Dusky Woodswallow | Vulnerable | No | No |
| *Callocephalon fimbriatum* Gang-gang Cockatoo (Foraging) | Vulnerable | No | No |
| *Calyptorhynchus lathami* Glossy Black-Cockatoo (Foraging) | Vulnerable | No | Yes. No presence of Allocasuarina or Casuarina spp. found in this zone |
| *Daphoenositta chrysoptera* Varied Sittella | Vulnerable | No | No |
| *Dasyurus maculatus* Spotted-tailed Quoll | Vulnerable | No | No |
| *Falsistrellus tasmaniensis* Eastern False Pipistrelle | Vulnerable | No | No |
| *Hieraaetus morphnoides* Little Eagle (Foraging) | Vulnerable | No | No |
| *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat | Vulnerable | No | No |
| *Miniopterus orianae oceanensis* Large Bent-winged bat (Foraging) | Vulnerable | No | No |
| *Ninox strenua* Powerful Owl (Foraging) | Vulnerable | No | No |
| *Petaurus australis* Yellow-bellied Glider | Vulnerable | No | Yes. No hollow bearing trees with hollows greater than 25cm diameter are located within this Zone |
| *Petroica boodang* Scarlet Robin | Vulnerable | No | No |
| *Petroica phoenicea* Flame Robin | Vulnerable | No | No |
| *Phascolarctos cinereus* Koala (Foraging) | Vulnerable | No | No |
| *Pteropus poliocephalus* Grey-headed Flying-fox (Foraging) | Vulnerable | No | No |

| Scientific Name | BC Act Status | Excluded from assessment? Vegetation Zones | |
|---|---|---|---|
| | | Zone 1 | Zone 2 |
| *Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat | Vulnerable | No | No |
| *Scoteanax 41ueppellii* Greater Broad-nosed Bat | Vulnerable | No | No |
| *Varanus rosenbergi* Rosenberg's Goanna | Vulnerable | No | No |

## 4.2 Candidate Species Credit Species Summary

This section provides a summary of the candidate species credit fauna, flora and fungi species for the Subject Land derived from BAMC (DPIE 2020b) and a 10km BioNet Atlas Search (DPIE 2020f). A summary of the targeted survey effort applied to each species is provided along with the results of the survey effort, specifically whether or not the species credit needs to be offset through retiring of Biodiversity Offset Credits (**Table 11; Table 12**).

**Table 11. Candidate Fauna Credit Species predicted to occur within the Subject Land**

| Scientific Name | BC Act listing status | Included in Assessment? | Targeted Survey Conducted? | Biodiversity Risk Weighting | Biodiversity Offset Credits Required? |
|---|---|---|---|---|---|
| *Callocephalon fimbriatum* Gang-gang Cockatoo (Breeding) | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | High – 2 | No |
| *Calyptorhynchus lathami* Glossy Black- Cockatoo (Breeding) | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | High – 2 | No |
| *Cercartetus nanus* Eastern Pygmy-possum | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | High – 2 | No |
| *Chalinolobus dwyeri* Large-eared Pied Bat | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | Very High – 3 | No |
| *Hieraaetus morphnoides* Little Eagle (Breeding) | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | Moderate – 1.5 | No |
| *Miniopterus orianae oceanensis* Large Bent-winged Bat (Breeding) | Vulnerable | No | No – the Subject Land did not contain any breeding habitat suitable for this species. No caves, tunnels, mines, culverts or other structures known or suspected to be used for breeding occurred within the Subject Land. | Very High – 3 | No |
| *Myotis Macropus* Southern Myotis | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was confirmed as present within the Subject Land. | High – 2 | **Yes** |

| Scientific Name | BC Act listing status | Included in Assessment? | Targeted Survey Conducted? | Biodiversity Risk Weighting | Biodiversity Offset Credits Required? |
|---|---|---|---|---|---|
| *Ninox strenua* Powerful Owl (Breeding) | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | High – 2 | No |
| *Petauroides volans* Greater Glider | EPBC Listed Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | High – 2 | No |
| *Phascolarctos cinereus* Koala (Breeding) | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | High - 2 | No |
| *Pseudophryne australis* Red-crowned Toadlet | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | Moderate - 1.5 | No |
| *Pteropus poliocephalus* Grey-headed Flying-fox (Breeding) | Vulnerable | No | No. No breeding camps were located within or nearby the Subject Land. | High – 2 | No |

Table 12. Candidate Flora Credit Species predicted to occur within the Subject Land

| Scientific Name | NSW BC Act (2016) listing status | Included in Assessment? | Targeted Survey Conducted? | Biodiversity Risk Weighting | Biodiversity Offset Credits Required? |
|---|---|---|---|---|---|
| Eucalyptus macarthurii Paddy's River Box | Endangered | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | High - 2 | No |
| Pterostylis pulchella Waterfall Greenhood | Vulnerable | Yes | Yes. Targeted survey was conducted for this species during the approved DPIE survey period and this species was not identified. | Very High - 3 | No |

## 4.3 Targeted Species Credit Surveys

Targeted threatened species surveys were undertaken for all threatened species determined likely to occur within the Subject Land, as predicted by the BAMC and historical records. All Species Credits species that have been ruled out were carried out within the approved survey period as identified within the BAMC **(Table 14; Table 15),** and were implemented in accordance with section 5.3 of the BAM and all relevant DPIE threatened species survey guidelines. The complete survey effort for all BAMC predicted threatened species are displayed in **Figure 12.**

Weather conditions taken from the nearest weather station (Moss Vale AWS; Station number 068239) in the lead up and during the field survey are outlined in **Table 13.** Rainfall was recorded in the week leading up to all site assessments. Such weather conditions are favourable for the targeted survey efforts of emergence/flowering of annual herbs and threatened frog species.

All surveys were completed by highly experienced Narla Ecologists, with hundreds of hours threatened species survey experience across NSW. The qualification of all people completing the relevant surveys are provided at the beginning of this report.

**Table 13. Weather conditions taken from the nearest weather station (Moss Vale AWS; Station number 068239) in the lead up and during the field survey (BOM 2020; Survey date in bold).**

| Task | Undertaken By (Approximate Hours Spent) | Survey date | Minimum Temp. °C | Maximum Temp. °C | Rainfall (mm) |
|---|---|---|---|---|---|
| Lead up to Site Assessment and Survey | - | 06/02/2020 | 15.4 | 19.2 | 0.6 |
| | | 07/02/2020 | 15.9 | 173. | 23.0 |
| | | 08/02/2020 | 14.6 | 18.2 | 19.4 |
| | | 09/02/2020 | 15.4 | 18.3 | 43.6 |
| | | 10/02/2020 | 15.3 | 24.0 | 107.8 |
| | | 11/02/2020 | 17.6 | 27.7 | 0 |
| **Vegetation Assessment and Targeted Survey** | **Chris Moore and Sarah Cardenzana (16 hours)** | **12/02/2020** | **18.2** | **21.9** | **13.0** |
| Lead up to targeted surveys | - | 27/07/2020 | 10.1 | 11.5 | 50.4 |
| | | 28/07/2020 | 8.6 | 12.1 | 70.0 |
| | | 29/07/2020 | 4.8 | 13.9 | 1.6 |
| | | 30/07/2020 | 3.3 | 12.9 | 0.2 |
| | | 31/07/2020 | 2.8 | 12.4 | 0 |
| | | 01/08/2020 | -1.7 | 14.7 | 0.2 |
| **Targeted Survey (Spotlighting, Diurnal Bird Surveys, call playback)** | **Polina Zadorojnaya and Jonathon Coy (25 hours)** | **02/08/2020** | **0.3** | **15.6** | **0** |
| | | **03/08/2020** | **-1.1** | **15.4** | **0.2** |
| | | **04/08/2020** | **5.9** | **14.3** | **0** |
| | | **05/08/2020** | **-0.3** | **8.4** | **0** |
| | | **06/08/2020** | **0.4** | **11.4** | **0** |
| | | **07/08/2020** | **0.7** | **9.8** | **2.8** |
| Lead up to targeted surveys | - | 10/11/2020 | 6.4 | 22.1 | 0.2 |
| | | 11/11/2020 | 9.7 | 24.9 | 0.2 |
| | | 12/11/2020 | 14.4 | 25.8 | 0 |
| | | 13/11/2020 | 14.5 | 23.6 | 3.4 |
| | | 14/11/2020 | 8.6 | 21.7 | 4.0 |
| | | 15/11/2020 | 7.0 | 27.8 | 0 |
| **Targeted Survey (Spotlighting, Diurnal Bird Surveys, call playback, harp trapping, camera trapping)** | **Stefan Giessler and Sjaak Verstappen (18 hours)** | **16/11/2020** | **17.3** | **29.7** | **0** |
| | | **17/11/2020** | **10.1** | **21.3** | **0** |
| | | **18/11/2020** | **11.3** | **20.8** | **0.6** |
| | | **19/11/2020** | **11.1** | **26.1** | **0** |
| | | **20/11/2020** | **13.6** | **31.6** | **0** |

## 4.4 Flora Species Credit Survey

A total of two (2) threatened flora species were identified within the BAMC (DPIE 2020b) as having the potential to occur within the Subject Land.

Targeted flora surveys were conducted for species listed in **Table 14** over multiple days in February, August and November 2020 by Narla Environmental Ecologists **(Figure 12).** Targeted surveys were undertaken in accordance with the 'Surveying threatened plants and their habitats - NSW survey guide for the Biodiversity Assessment Method (DPIE 2020d) with maximum effort directed toward the proposed development site.

**Table 14. Threatened flora species identified in the BAM Calculator and BioNet Search Tool as having potential to occur within the Subject Land, and DPIE endorsed survey periods.**

| Candidate Flora Species | Survey Period (BAMC) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| *Eucalyptus macarthurii* | | ✓ | | | | | | ✓ | | | ✓ | |
| *Pterostylis pulchella* | | ✓ | | | | | | | | | | |
| Key | ✓ = Surveyed | | | | | | = Optimum Survey Period | | | | | |

## 4.5 Fauna Species Credit Survey

A suite of threatened fauna species were identified within the BAMC (DPIE 2020b) as having the potential to occur within the Subject Land due to the presence of suitable habitat. All potentially occurring species were surveyed within the appropriate DPIE approved survey period (**Table 15**).

Justification for determining that certain predicted species credit species were unlikely to have suitable habitat on the Subject Land are provided earlier in **Table 11.**

**Table 15. Threatened Fauna species identified in the BAM Calculator and BioNet Search Tool as having potential to occur within the Subject Land, and DPIE endorsed survey periods.**

| Candidate Fauna Species | Survey Period (BAMC) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| *Callocephalon fimbriatum* Gang-gang Cockatoo | | | | | | | | | | | ✓ | |
| *Calyptorhynchus lathami* Glossy Black Cockatoo | | | | | | | | ✓ | | | | |
| *Cercartetus nanus* Eastern Pygmy-possum | | | | | | | | | | | ✓ | |
| *Chalinolobus dwyeri* Large-eared Pied Bat | | | | | | | | | | | ✓ | |
| *Hieraaetus morphnoides* Little Eagle | | | | | | | | ✓ | | | | |
| *Myotis macropus* Southern Myotis **(Confirmed)** | | | | | | | | | | | ✓ | |

| Candidate Fauna Species | Survey Period (BAMC) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| *Ninox strenua* Powerful Owl | | | | | | | | ✓ | | | | |
| *Petauroides volans* Greater Glider | | | | | | | | ✓ | | | ✓ | |
| *Phascolarctos cinereus* Koala | | ✓ | | | | | | ✓ | | | ✓ | |
| *Pseudophryne australis* Red-crowned Toadlet | | ✓ | | | | | | ✓ | | | ✓ | |
| Key | ✓ = Surveyed | | | | | = Optimum Survey Period | | | | | | |

### 4.5.1 Targeted Microbat Survey

The following species credit microbat species were identified by the BAMC as having the potential to utilise the habitat within the Subject Land:

- *Myotis macropus* (Southern Myotis)
- *Chalinolobus dwyeri* (Large-eared Pied Bat).

Targeted surveys for this species was required to determine its presence or absence. Targeted surveys were undertaken in accordance with 'Species credit threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method' (OEH 2018a). The targeted survey involved the use of harp traps and acoustic recording devices. One (1) harp trap was positioned within potential microbat 'flyways' in the Subject Land. And four (4) passive acoustic recording devices (Wildlife Acoustics SongMeter SM4BAT) were randomly placed throughout the Subject Land. The targeted survey effort undertaken for these species is detailed in **Table 16.**

No threatened species were captured during harp trapping. However, one (1) threatened species were identified via passive acoustic recording devices: *Myotis macropus (Southern Myotis)*. As this species was identified within the Subject Land, during the appropriate DPIE survey window, with suitable habitat present. The preparation of a species polygon and associated offsets are required.

**Table 16. Microbat targeted survey effort undertaken within the Subject Land.**

| Target Species | Survey Technique | Survey Effort and Timing | Target Species Identified? |
|---|---|---|---|
| *Myotis macropus* (Southern Myotis) | Harp Trapping | One (1) trap deployed for four (4) nights between approximately 8pm and 5am. | **Yes** |
| | SM4BAT | Four (4) devices deployed for four (4) nights between approximately 8pm and 5am. | |
| *Chalinolobus dwyeri* (Large-eared Pied Bat) | Harp Trapping | One (1) trap deployed for four (4) nights between approximately 8pm and 5am. | No |
| | SM4BAT | Four (4) devices deployed for four (4) nights between approximately 8pm and 5am. | |

#### 4.5.1.1 Southern Myotis Identification

Recordings captured by the Ultrasonic Bat Recorders (SM4Bat), established around the site, were sent to experienced Bat Recording Analyst, Peter Knock (Fauna Sonics) who was able to identify the species present within the Subject Land. It was confirmed from Peter's analysis that Southern Myotis was identified from a few single passes.

### 4.5.2 Threatened Mammal Species Credit Survey

Three (3) threatened mammal species were identified by the BAMC as being likely to occur within the Subject Land and therefore required targeted survey to determine their presence/absence.:

- *Cercartetus nanus* (Eastern Pygmy Possum);
- *Petauroides volans* (Greater Glider)
- *Phascolarctos cinereus* (Koala)

In order to determine the presence/absence of these species within the Subject Land, targeted surveys in accordance with the NSW '*Threatened Species Survey and Assessment: Guidelines for developments and activities*' were undertaken (DEC 2004). The targeted survey effort undertaken for these species is detailed in **Table 21.**

None of the BAMC predicted threatened mammal species were identified within the Subject Land or its surrounds.

**Table 17. Threatened Mammal targeted survey effort undertaken within the Subject Land.**

| Target Species | Survey Technique | Survey Effort & Timing | Target Species Identified? |
|---|---|---|---|
| *Phascolarctos cinereus* (Koala) | Nocturnal Spotlighting Transect | One (1) session per night for eight (8) nights between 8:00pm and 11:00pm. Four (4) nights in August and four (4) nights in November. | No |

| | | | |
|---|---|---|---|
| *Cercartetus nanus*<br>(Eastern Pygmy-possum)<br>*Petauroides volans*<br>(Greater Glider) | Baited Motion Sensor Cameras | Five (5) devices over four (4) days and nights running continuously | No |
| | Nocturnal Spotlighting Transects | One (1) session per night for four (4) consecutive nights between 8:00pm and 11:00pm | |

### 4.5.3 Threatened Amphibian Targeted Survey

One (1) threatened amphibian species was identified by the BAMC as being likely to occur within the Subject Land and therefore required targeted survey to determine their presence/absence:

- *Pseudophryne australis* (Red-crowned Toadlet)

In order to determine the presence/absence of these species, targeted surveys were conducted in accordance with the NSW '*Threatened Species Survey and Assessment: Field Survey Methods for Fauna: Amphibians'* (DECC 2009) and the '*NSW Survey Guide for Threatened Frogs: a guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method*' (DPIE 2020i). The targeted survey effort undertaken for these species is detailed in **Table 22**.

As no evidence of any BAMC predicted threatened amphibian species was identified as occurring within the Subject Land within the optimal survey period, the applicant is not required to purchase and retire any Biodiversity Offset Credits for these species.

**Table 18. Threatened amphibian targeted survey effort within the Subject Land.**

| Target Species | Survey Technique | Survey Effort & Timing | Target Species Identified? |
|---|---|---|---|
| *Pseudophryne australis*<br>(Red-crowned Toadlet) | Nocturnal Call Playback | Multiple call playback points were established and undertaken twice per night for 4 nights between approximately 8:00pm and 11:00pm | No |
| | Nocturnal Spotlighting and Targeted Micro-habitat Searches | One (1) session per night for four (4) consecutive nights between 8:00pm and 11:00pm | |
| | SM4 acoustic recorder | two (2) devices over four (4) days and nights running continuously | |

### 4.5.4 Targeted Avian Species Credit Survey

Four (4) threatened avian species were identified by the BAMC as being likely to occur within the Subject Land *and* therefore required targeted survey to determine their absence:

- *Callocephalon fimbriatum* (Gang-gang Cockatoo);
- *Calyptorhynchus lathami* (Glossy-black Cockatoo);
- *Hieraaetus morphnoides* (Little Eagle),
- *Ninox strenua* (Powerful Owl)

Targeted surveys were carried-out in accordance with the NSW '*Threatened Species Survey and Assessment: Guidelines for developments and activities*' were undertaken (DEC 2004). The targeted survey effort undertaken for these species is detailed in **Table 19.**

As no evidence of the following species was identified as occurring within the Subject Land within the optimal survey period, the applicant is not required to purchase and retire any Biodiversity Offset Credits for these species.

**Table 19. Threatened avian targeted survey effort within the Subject Land.**

| Target Species | Survey Technique | Survey Effort & Timing | Target Species Identified? |
|---|---|---|---|
| *Callocephalon fimbriatum* (Gang-gang Cockatoo) *Calyptorhynchus lathami* (Glossy-black Cockatoo) *Hieraaetus morphnoides* (Little Eagle) | Diurnal Bird Surveys and Habitat Surveys (Area Search) | 2 days of morning surveys and habitat searches (large nests) traversing the entire site during the appropriate survey timetable | No |
| *Ninox strenua* (Powerful Owl) | Nocturnal Call Playback | Multiple call playback points were established and undertaken twice per night for 4 nights between approximately 8:00pm and 11:00 | No |
| | SM4 acoustic recorder | Two (2) devices over five (5) nights. | |

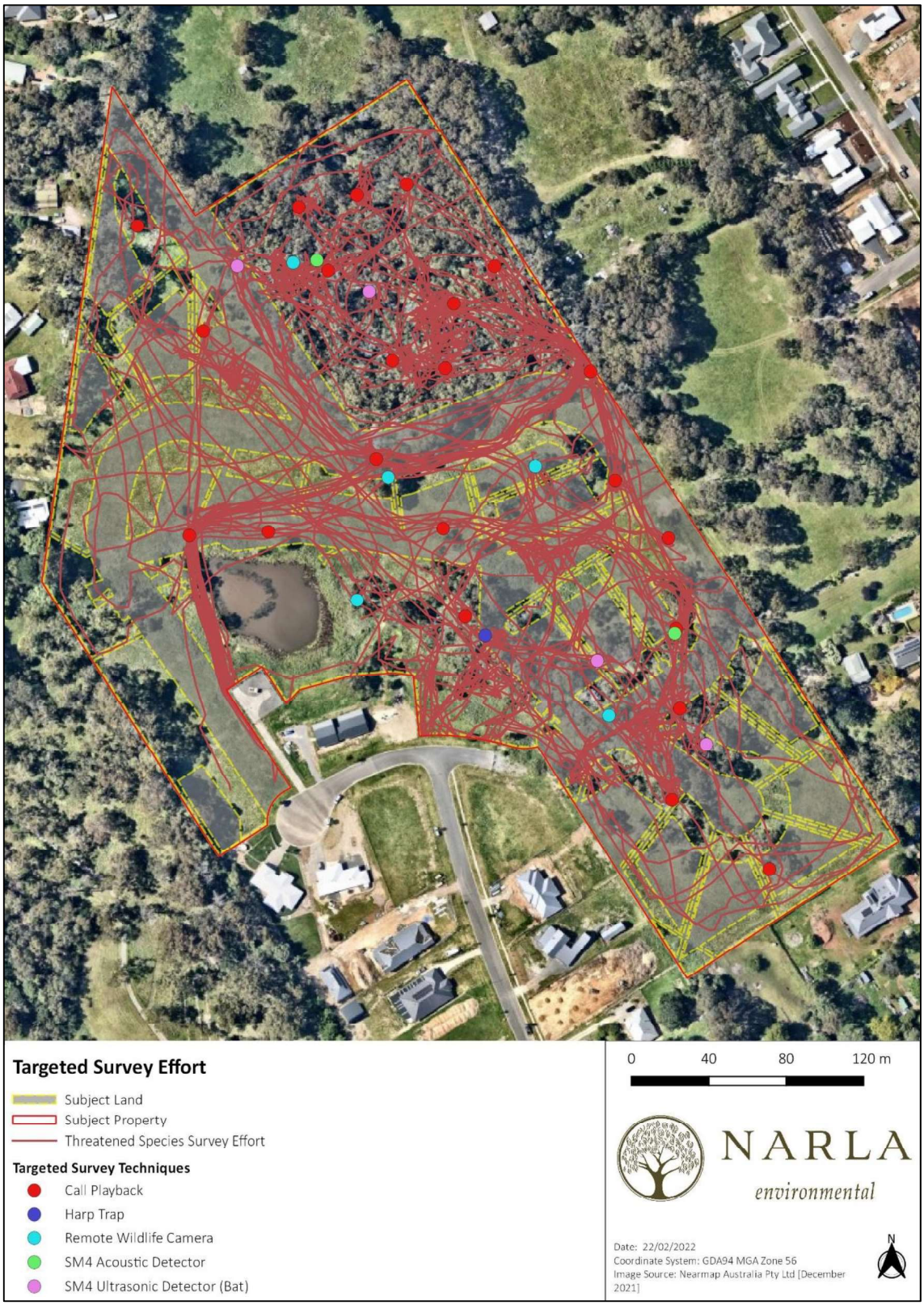


Figure 12. Fauna and Flora species credit targeted survey effort undertaken by Narla Environmental within the Subject Land and Study Area.

## 4.6 Species Polygons

Species polygons were created for the following Species Credit species confirmed within the Subject Land (**Figure 13**):

- *Myotis macropus* (Southern Myotis): the species polygon encompasses all of Vegetation Zone 1 located within a 200m buffer of the waterbody located within the Subject Land. Vegetation Zone 2 was excluded from the species buffer as it the species is unlikely to utilise this vegetation based on the lack of suitable habitat (Eco Logical 2021).

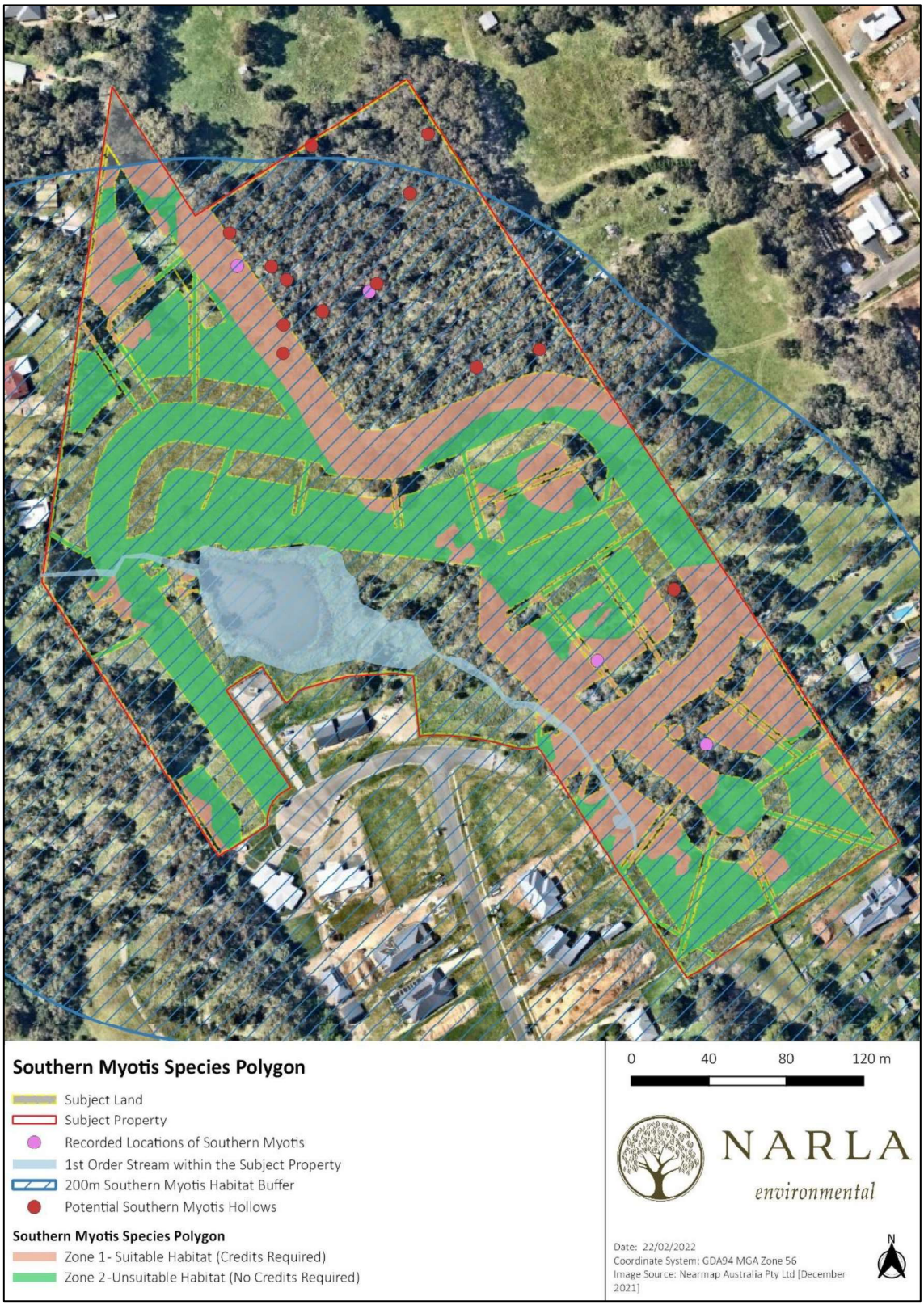


Figure 13.Confirmed Present Southern Myotis species polygon.

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# 5. Avoid and Minimise Impacts

## 5.1 Impact Mitigation and Minimisation Measures

This section details the measures to be implemented before, during and post construction to avoid and minimise the impacts of the project **(Table 20).**

**Table 20. Table of measures to be implemented before, during and after construction to avoid and minimise the impacts of the project.**

| Action | Outcome | Timing | Responsibility |
|---|---|---|---|
| **Avoid and Minimise Impact - Project Location and design** | The proposed subdivision has been designed to minimise the impacts on biodiversity where possible. Despite sections of remnant vegetation requiring removal, a large portion of the subdivision will take place in historically cleared grassland. In addition, a large section of remnant bushland will remain untouched in the northern corner of the Subject Property, with a drainage reserve being created in the south. These areas will be protected under the establishment of a Vegetation Management Plan (Narla 2022) and will be assigned as "Community Lots". | Pre-construction phase | Proponent |
| **Avoid and Minimise Impact – Project Planning** | The proponent will leave a large section of remnant vegetation within the northern extent of the Subject Property untouched, and will create a drainage reserve that will be revegetated with flora that is representative of the Southern Highlands Shale Woodland EEC.<br>The proponent must ensure that adequate erosion and sediment measures are in place at all times during construction activity. Always follow best practice guidelines (Landcom 2004). | Pre-construction phase | Proponent |
| **Assigning a Project Ecologist** | Prior to construction, the applicant should commission the services of a qualified and experienced Ecologist Consultant (minimum 3 years' experience) with a minimum tertiary degree in Science, Conservation, Biology, Ecology, Natural Resource Management, Environmental Science or Environmental Management.<br><br>The Ecologist must be licensed with a current Department of Primary Industries Animal Research Authority permit and New South Wales Scientific License issued under the BC Act.<br><br>The Ecologist will be commissioned to:<br>Help the applicant undertake any threatened species habitat augmentation or translocation;<br>Undertake any required targeted searches for threatened flora prior to vegetation clearing;<br>Undertake an extensive pre-clearing survey; delineating habitat-bearing trees and shrubs to be retained/removed; and<br>Supervise the clearance of trees (native and exotic) in order to capture, treat and/or relocate any displaced fauna. | Prior to vegetation clearance works | Proponent |

| Action | Outcome | Timing | Responsibility |
|---|---|---|---|
| Preparation of a Construction Environmental Management Plan (CEMP) | A Construction Environmental Management Plan (CEMP) may be required for the construction phase of the project, and will be prepared prior to issue of the Construction Certificate. The CEMP would include, as a minimum, industry-standard measures for the management of soil, surface water, weeds and pollutants, as well as site-specific measures, including the procedures outlined below. The proposed mitigation measures would include environmental safeguards for protection of neighbouring properties and nearby waterways in accordance with relevant policy documentation and Government guidelines. In order to address the potential impacts of the proposal on biodiversity, the mitigation and management measures outlined within this table would be implemented as part of the CEMP for the site. | Pre-construction phase | Proponent<br>Project Ecologist<br>Construction Contractor |
| Tree Protections | Australian Standard 4970 (2009) Protection of Trees on Development Sites (AS-4970) outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on construction sites. It is an area isolated from construction disturbance so that the tree remains viable. Ideally, works should be avoided within the TPZ.<br>A Minor Encroachment is less than 10% of the TPZ and is outside the SRZ. A Minor Encroachment is considered acceptable by AS-4970 when it is compensated for elsewhere and contiguous within the TPZ.<br>A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. Major Encroachments generally require root investigations undertaken by non-destructive methods or the use of tree sensitive construction methods. | Pre-construction phase | Proponent<br>Arborist |
| Preparation of a Vegetation Management Plan (VMP) | A VMP has been prepared (Narla 2022) for the Subject Property as the proposed works intersects the 10m riparian buffer of a first order stream, located to the south of the Subject Land. The VMP details the on-going habitat management, weed management, flora plantings and maintenance for the Subject Property. | Pre-construction phase | Project Ecologist<br>Proponent |
| Relocation of woody debris | Any woody debris (fallen trees and logs) within the Subject Land are to be relocated to the area of native vegetation within the northern extent of the property, that will be retained. | Construction phase | Project Ecologist<br>Proponent |
| Avoidance of hollow-bearing Trees | All hollow-bearing trees (including dead trees) should be retained where possible. | Construction phase | Project Ecologist<br>Proponent |
| Salvage and relocation of hollows<br><br>and/or<br><br>Installation of Artificial Hollows | In the event that large hollow-bearing trees require removal; salvage and reinstallation of the hollow is recommended.<br><br>The process to be undertaken should involve the soft felling of the tree at the base of the trunk so that the body of the tree remains in one single piece. The hollow bearing section of the tree can then be relocated and attached to a suitable tree in vegetated area of the subject property, that will be retained. The successful relocation of the identified habitat tree will ameliorate the loss of any hollow dwelling threatened fauna habitat features from within the proposed area of development. In the event that any existing tree hollows are damaged in the relocation process, the damaged habitat features are to be replaced with a habitat box at the compensatory ratio of 2:1. | Construction phase | Suitably qualified Arboriculturalist<br>Project Ecologist<br>Proponent |

| Action | Outcome | Timing | Responsibility |
|---|---|---|---|
| | During any relocation or removal of habitat trees identified within the site, a Project Ecologist is to be supervising at all times.<br><br>If relocation of the section of habitat tree cannot be achieved because of its size or structure, the applicant could explore the suitability of importing a smaller or more suitable felled hollow tree from another site and erecting that, or replacing with habitat boxes at the compensatory ratio of 2:1. | | |
| APZ | The APZ within the Subject Land will be maintained to meet the following guidelines (Harris Environmental 2022). Such guidelines must be followed to uphold future vegetation integrity scores.<br><u>Inner Protection Zone (IPA)</u><br>**Trees**<br>Canopy cover should be less than 15% at maturity.<br>Trees at maturity should not touch or overhang the building<br>Lower limbs should be removed up to a height of 2m above ground<br>Tree canopies should be separated by 2 to 5m and<br>Preference should be given to smooth barked and ever green trees<br>**Shrubs**<br>Create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings<br>Shrubs should not be located under trees<br>Shrubs should not form more than 10% ground cover.<br>Clumps of shrubs should separate from exposed windows and doors by a distance of at least twice the height of the vegetation<br>**Grass**<br>Should be kept mown (as a guide grass should be kept to no more than 100mm in height)<br>Leaves and vegetation debris should be removed<br><br><u>Outer Protection Zone (OPA)</u><br>**Trees**<br>Tree canopy cover should be less than 30%.<br>Canopies should be separated by 2-5m<br>**Shrubs**<br>Shrubs should not form a continuous canopy<br>Shrubs should form no more than 20% of ground cover.<br>**Grass**<br>Should be kept mown (as a guide grass should be kept to no more than 100mm in height)<br>Leaf and other debris should be removed. | Post-construction phase | Project Ecologist<br>Proponent<br>Arborist |
| Erosion and Sedimentation | Appropriate erosion and sediment control must be erected and maintained at all times during construction in order to avoid the potential of incurring indirect impacts on biodiversity values. As a | Construction phase | Proponent<br>Construction Contractor |

| Action | Outcome | Timing | Responsibility |
|---|---|---|---|
| | minimum, such measures should comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004). | | |
| Erection of temporary fencing | Temporary fencing should be erected around retained native vegetation that may incur indirect impacts on biodiversity values due to the construction works. | Construction phase | Proponent<br>Construction Contractor |
| Storage and Stockpiling (Soil and Materials) | Allocate all storage, stockpile and laydown sites away from any native vegetation that is planned to be retained. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site in order to avoid the potential of incurring indirect impacts on biodiversity values. | Construction phase | Construction Contractors |
| Stormwater | Potential impacts relating to stormwater and runoff will be managed during construction and operation phases. The Construction Environmental Management Plan (CEMP) will guide stormwater management during the construction phase of development. | Post-construction phase | Proponent<br>Construction Contractors/ Architect |

# 6. Impact Summary

## 6.1 Impacts on Biodiversity Values

### 6.1.1 Native Vegetation Clearance Requiring Offsetting

The following native vegetation within the Subject Land is proposed to be impacted as a result of the proposed development and will require the purchase and retirement of Biodiversity Offset Credits:

- 5ha representative of PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, Southern Sydney Basin Bioregion in total across three impact zones **(Figure 11).**

### 6.1.2 Serious and irreversible impact (SAII)

One (1) threatened ecological community confirmed within the Subject Land has been identified as a potential 'SAII entity' **Table 21**):

- Southern Highlands Shale Woodland in the Sydney Basin; and

The threshold for consideration of SAII for Southern Highlands Shale Woodland in the Sydney Basin Bioregion is currently under development. This means that any impact on the potential habitat for this ecological community could be considered 'serious and irreversible'. Due to the potential sensitivity of this ecological community to any impact, a determination of whether or not the proposed impacts are serious and irreversible are to be undertaken in accordance with Section 9.1 of the BAM (DPIE 2020a): 'Additional impact assessment provisions for ecological communities.' This is outlined in **Table 22.**

**Table 21. Identification and justification for ecological communities and/or species considered to be at risk of Serious and irreversible Impacts**

| Threatened Ecological Community / or species | Criteria for identifying potential entities | Justification for listing | Threshold for consideration of SAII | Present on the Subject Land |
|---|---|---|---|---|
| Southern Highlands Shale Woodland | Principle 1 – species or ecological community currently in a rapid rate of decline.<br><br>Principle 2 – species or ecological communities with very small population size. | Population size | Under development | Yes |

Table 22. Additional impact assessment provisions for ecological communities that are associated with a serious and irreversible impact

| Serious and Irreversible Impact (SAII)<br>Impact assessment provisions for ecological communities:<br>Southern Highlands Shale Woodland in the Sydney Basin Bioregion | |
|---|---|
| **BC Act Status: Endangered** | |
| the action and measures taken to avoid the direct and indirect impact on the potential entity for a SAII | The proposed subdivision has taken measures to avoid direct and indirect impacts on Southern Highlands Shale Woodland (SHSW) where possible. The subdivision will be required to remove 1.63ha of remnant canopy vegetation and 2.88ha of historically cleared low quality grassland vegetation. The subdivision will also require the continued management of 0.38 ha of remnant vegetation as an Inner Protection Area and 0.11ha as an Outer Protection Area. Approximately 1.8ha of good quality remnant vegetation will remain untouched in the northern extent of the Subject Property with a drainage reserve also to be created in the south which will be restored under the guide of a VMP with vegetation representative of the SHSW Community. |
| the area (ha) and condition of the threatened ecological community (TEC) to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone | The subdivision will be required to remove 1.63ha of remnant canopy vegetation and 2.88ha of historically cleared low quality grassland vegetation. The subdivision will also require the continued management of 0.38 ha of remnant vegetation as an Inner Protection Area and 0.11ha as an Outer Protection Area. No wholesale clearing will occur within the areas mapped as inner or outer protection areas. On select removal to meet asset protection zone requirements.<br>The remnant vegetation zone located across the site was in moderate condition with an intact canopy but lacking mid-story. The VIS score created for this zone was 51.2.<br>The grassland vegetation zone located across the site was in low condition. With low species diversity and a relatively high percentage of high threat exotics (HTE). The VIS score for this zone was 13.8. |
| a description of the extent to which the impact exceeds the threshold for the potential entity that is specified in the Guideline for determining an SAII | The impact thresholds for this community are currently development therefore no description can be provided for whether or not the proposed subdivision will exceed this threshold or not. |
| the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint | Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands (Tozer et al, 2010) indicates the presence of 250.93 ha of SHSW within an area of 1000ha and 487.15ha within an area of 10,000ha surrounding the development footprint. Overall conditions cannot be determined for such an area without ground truthing. |
| an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration | Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands (Tozer et al, 2010) mapping indicates the presence of 4721ha of SHSW within the 'Moss Vale' IBRA subregion. Taking into account the impact of the subdivision will be required to remove 1.63ha of remnant canopy vegetation and 2.88ha of historically cleared low quality grassland vegetation. The subdivision will also require the continued management of 0.38 ha of remnant vegetation as an Inner Protection Area and 0.11ha as an Outer Protection Area for a total impact area of 5ha. The remaining vegetation within the 'Moss Vale' IBRA Subregion after the proposed subdivision will be still be 4716ha. Overall conditions cannot be determined for such an area without ground truthing. |
| an estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and the IBRA subregion | Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands (Tozer et al, 2010) mapping indicates the presence of 16.38a of the community within the NPWS reserve system in the 'Moss Vale' IBRA Subregion and 75.334ha in Sydney Basin IBRA Region. |

| Serious and Irreversible Impact (SAII)<br>Impact assessment provisions for ecological communities:<br>Southern Highlands Shale Woodland in the Sydney Basin Bioregion | | |
|---|---|---|
| BC Act Status: Endangered | | |
| the development, clearing or biodiversity certification proposal's impact on: | abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns | The proposed subdivision may result in a slight increase in water runoff and nutrients into adjacent areas of SHSW. However, it is unlikely that the proposed development will exacerbate abiotic factors given the location of the community in a highly disturbed, fragmented area typical of an agricultural landscape. |
| | characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants | The areas of remnant SHSW within the Subject Land are of a moderate quality with an intact canopy but a lacking mid-storey and ground layer. Fire and flood regimes have also been largely altered due to past land management practices and surrounding residential development. It is therefore highly unlikely that the proposed subdivision will exacerbate impacts on characteristic and functionally important species as the area is already highly altered and degraded. The asset protection zones in place, will also not result in wholesale clearing of vegetation rather select removal to meet asset protection zone compliance. |
| | the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC | The proposed development may enhance weed infiltration into adjacent habitat by an increase in edge effects. However, the abundance of invasive species within the Subject Land and adjacent properties is already apparent. Also given the location is in a highly fragmented area, it is highly unlikely the proposed development will significantly impact on the quality and integrity of the remaining SHSW within and adjacent to the Subject Land. |
| direct or indirect fragmentation and isolation of an important area of the potential TEC | The current network of SHSW within and adjacent to the Subject Property is already located in a highly fragmented area, and is not considered a priority management site by the NSW Government Saving our Species (2019), however it is located within the Priority Management Area along. Connectivity with the areas of SHSW on the surrounding properties was already fragmented, however the retention of the large patch of SHSW in the northern extent of the Subject Property will ensure some connection connectivity continues. | |

| Serious and Irreversible Impact (SAII)<br>Impact assessment provisions for ecological communities:<br>Southern Highlands Shale Woodland in the Sydney Basin Bioregion | |
|---|---|
| **BC Act Status: Endangered** | |
| **the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.** | NSW Government Saving our Species (2019) has identified the majority of the Southern Highlands as a Priority Management Area for SHSW. Various measures have been proposed in the region to manage critical threats to conserve this ecological community, including:<br>Encourage private land conservation through a variety of measures, including providing advice to Wingecarribee Shire Council to update their private land biodiversity conservation strategy, assisting where appropriate in brokering NSW Biodiversity Conservation Trust agreements, and supporting other programs such as Land for Wildlife and the Conservation Partners program and Local Land Services/Water NSW Rural Landscape Program.<br>Update and distribute literature outlining the occurrence and importance of protecting the TEC in the local area, including information to encourage private landholders to enter into stewardship agreements or covenants, as appropriate.<br>Conduct priority area mapping to inform targeted revegetation (especially of the severely over-cleared riparian zones), roadside vegetation management, revegetation planning and conservation for the Southern Highlands Shale Woodland TEC.<br>Increase awareness within the community through the distribution of the Rural Living Guide and on-site signage of the values of remnant patches, including fallen timber and dead trees, and the legal requirements for harvesting firewood. Increase protection of important remnants on public land through fencing, bollards and other access deterrents.<br>Supplement lost timber with woody debris. Develop guidelines for land managers to retain dead and standing material in place.<br>Prepare fact sheets and other materials that highlight the damage that can be caused by feral herbivores, particularly deer.<br>Provide landholders with information about grazing management which outlines stocking rates and other grazing management measures that are sympathetic with managing the Southern Highland Shale Woodland TEC. Conduct targeted community engagement to highlight the impacts of agriculture on the TEC including soil erosion, excess nutrients and overgrazing and provide guidance materials outlining mitigation.<br>Prioritise the treatment of key weed species including: barberry, blackberries, ivy, serrated tussock and honeysuckle. Work with Wingecarribee Shire Council to develop guidelines and procedures to assist landholders in the early identification and management of weed threats.<br>Review/define burning thresholds for remnant patches of the TEC. Engage with NSW Rural Fire Service and Fire and Rescue to promote the benefits of ecological burning in remnants. Use this engagement to identify opportunities to burn remnant patches.<br><br>Various impact mitigation measures are also to be implemented before, during and post construction to avoid and minimise the impacts of the project on SHSW (Table 20). No ecosystem credits are required to offset the biodiversity impacts of the proposed development. |

## 6.2 Other Impacts

### 6.2.1 Indirect Impacts

Indirect impacts occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities and threatened species habitat beyond the Subject Land. Impacts may also result from changes to land-use patterns, such as an increase in vehicular access and human activity on native vegetation, threatened ecological communities and threatened species habitat. The indirect impacts of this proposed development are outlined in **Table 23.**

**Table 23. Indirect Impacts**

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| (a) inadvertent impacts on adjacent habitat or vegetation | The proposed subdivision may increase surface run-off into the adjacent habitat which may in turn increase weed infestations, increase erosion and impact on hydrology within the adjacent habitat. | Southern Highland Shale Woodland | The remnant vegetation located within the northern of the Subject Property is located upslope from the proposed development and is unlikely to be impacted by surface runoff. The drainage reserve however in the south of the property is the most likely to be impacted by an increase in surface runoff from the proposed subdivision. The drainage reserve however, will be monitored and restored through the implementation of a VMP which will address the minimisation of inadvertent impacts on this area. |
| (b) reduced viability of adjacent habitat due to edge effects | The proposed subdivision may lead to enhanced weed infiltration into adjacent habitat by increased edge effects. This impact is likely to be restricted to the immediate area surrounding the construction footprint to a couple of metres. | Southern Highland Shale Woodland | Edge effects may increase weed intensity and reduce vegetation integrity. This will be managed by the implementation of a VMP that will guide the restoration of all remaining |

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| | | | vegetation within the Subject Property. |
| (c) reduced viability of adjacent habitat due to noise, dust or light spill | Noise from machinery can be expected to be generated as part of the subdivision installation. Noise is only expected during normal working hours (7am to 5pm) within the construction period and therefore unlikely to impact on nocturnal species including the Powerful Owl, Eastern-pygmy Possum and Southern Myotis which may forage at night.<br>There will be increased noise from the utilisation of a previously unoccupied piece of land. The site is already prone to noises from traffic, and surrounding properties.<br>Given the hazardous nature of the soil contamination any dust will and must be suppressed for human safety during the soil remediation stage. Reduced airborne particles should lower the impact of dust on adjacent areas of biodiversity value.<br>Some dust generation can be expected during the construction phase. The dust generation is expected to be low and not impact the viability of adjacent habitat. | Southern Myotis | All areas of potential habitat impacted by the proposed subdivision will be offset. |
| (d) transport of weeds and pathogens from the site to adjacent vegetation | The proposed subdivision may lead to enhanced weed infiltration into adjacent habitat by enhanced edge effects. This impact is likely to be restricted to the immediate area surrounding the development to a couple of metres. | Southern Highland Shale Woodland | There is potential for an increase in weed intensity and reduce vegetation integrity as a result of an increase in vehicle and machinery usage within the Subject Property. This will be managed by the implementation of a VMP that will guide the restoration of all remaining vegetation within the Subject Property. |

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| (e) increased risk of starvation, exposure and loss of shade or shelter | The proposed subdivision will require the removal of a section of already fragmented vegetation, that could provide habitat to a number of assumed present threatened species. A large section of intact bushland however, will remain intact in the north of the Subject Property that will continue to provide potential habitat for these species.<br>The drainage reserve in the south of the property will also be restored under the guidance of a VMP that will help minimise any exposure cause by the proposed subdivision. | Southern Myotis | The implementation of the recommendations and mitigation measures within this document (**Section 5**) will reduce risks to all assumed present threatened species.<br>As a precaution, all areas of potential habitat within the Subject Land will be offset. |
| (f) loss of breeding habitats | The proposed development may require the removal of several hollow-bearing trees.<br><br>All hollows removed to facilitate the subdivision, should be replaced at a ratio of 2:1 elsewhere within the subject property. | Southern Myotis | The implementation of recommendations and mitigation measures within this document will result in no net loss of potential breeding habitat for the threatened species assumed to be present within the subject land.<br>As a precaution, all areas of potential habitat within the Subject Land will be offset. |
| (g) trampling of threatened flora species | No threatened flora species were identified within the Subject Land. It is therefore not expected that the trampling of threatened flora species will occur. | N/A | N/A |
| (h) inhibition of nitrogen fixation and increased soil salinity | It is unlikely that these issues affect the Subject Land. | N/A | N/A |
| (i) fertiliser drift | This issue currently exists on the subject land. It is unlikely that the proposal would significantly increase this impact. | Southern Highlands Shale Woodlands | It is not expected that fertiliser application will cause significant impacts such that the bioregional persistence of threatened species, |

| Indirect Impact | Extent and duration | Threatened species, threatened ecological communities and their habitats likely to be affected. | Consequences of the impacts for the bioregional persistence of the threatened species, threatened ecological communities and their habitats. |
|---|---|---|---|
| | | | ecological communities or their habitats could be impacted. |
| (j) rubbish dumping | This issue is not expected to be exacerbated as a result of the proposed subdivision. | N/A | N/A |
| (k) wood collection | This issue is not likely to affect the vegetation on the Subject Land. | N/A | N/A |
| (l) bush rock removal and disturbance | This issue is not relevant to the Subject Land as there is no bush rock. | N/A | N/A |
| (m) increase in predatory species populations | It is unlikely that the proposed works will influence or alter predatory species populations. | N/A | N/A |
| (n) increase in pest animal populations | It is unlikely that the proposed works will influence or alter predatory species populations. | N/A | N/A |
| (o) increased risk of fire | The proposed development is situated in bushfire prone land and has been assessed as being High risk.<br>Implementation of recommendations from the corresponding bushfire report (Harris Environmental 2020) will mitigate any increased risk of fire. | NA | NA |
| (p) disturbance to specialist breeding and foraging habitat, e.g. beach nesting for shorebirds. | The proposed development may require the removal of several hollow-bearing trees.<br><br>All hollows removed to facilitate the subdivision, should be replaced at a ratio of 2:1 elsewhere within the subject property. | Southern Myotis | The implementation of recommendations and mitigation measures within this document will result in no net loss of potential breeding habitat for the threatened species assumed to be present within the subject land.<br>As a precaution, all areas of potential habitat within the Subject Land will be offset. |

### 6.2.2 Prescribed and Uncertain Impacts

Certain projects may have impacts on biodiversity values in addition to, or instead of, impacts from clearing vegetation and/or loss of habitat. For many of these impacts, the biodiversity values may be difficult to quantify, replace or offset, making avoiding and minimising impacts critical. Prescribed biodiversity impacts require an assessment of the impacts of the development on the habitat of threatened species or ecological communities. This is discussed in **Table 24**.

**Table 24. Prescribed and Uncertain Impacts**

| Will there be impacts on any of the following | Yes/No | If Yes, Address all of the assessment questions from section 6 of the BAM |
|---|---|---|
| On the habitat of threatened entities including:<br>▪ Karsts, caves, cliffs, rocks and other geological features of significance; or<br>▪ Human-made structures, or<br>▪ Non-native vegetation | No | There are no karsts, caves, crevices, cliffs and other features of geological, human-made structures or non-native vegetation on or near the Subject Land. |
| On areas connecting threatened species habitat, such as movement corridors | No | The only threatened species identified to utilise the Subject Land was the Southern Myotis. As the hydroline within the site is proposed to be retained along within a significant patch of vegetation it is not anticipated that this highly mobile species will be significantly restricted in its movement across the site. |
| That affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining) | No | Southern Myotis is a fishing bat that is dependent on bodies of water for foraging habitat. The waterbody located on the Subject Property will be retained therefore it is unlikely that there will be any impact on the foraging behaviour of the species. Furthermore, filtration works are proposed to be conducted where the proposed road crosses drainage reserve which will ensure the water quality and flow is not altered, which will enable the habitat to remain viable. A Vegetation Management Plan (Narla 2020a) has also been prepared for this area which will guide the revegetation of the drainage reserve, which will intern create areas of suitable habitat for this species. |
| On threatened and protected animals from turbine strikes from a wind farm | No | There are no wind turbines proposed to be established on the Subject Land. |
| on threatened species or fauna that are part of a TEC from vehicle strikes. | No | The proposed subdivision would result in an increase of people in the area which in turn will result in the increase of vehicle usage.<br>The area of substantial habitat to be retained within the northern section of the Subject Property is already fenced off to exclude people and vehicles, therefore it is unlikely that there would be a significant increase of vehicle strike on threatened species. |

# 7. Other relevant Legislation or Planning Policies Requiring Address

## 7.1 Groundwater Dependent Ecosystems

The Australian Government Atlas of Groundwater Dependent Ecosystems (BOM 2019a) was reviewed and it was identified that the Subject Land does not contain a GDE. During on-ground surveys no GDE were evident.

## 7.2 NSW Fisheries Management Act 1994

It is not expected that the proposed development will impact upon any habitat for threatened fish as listed under the *NSW Fisheries Management Act 1994*, neither will the subdivision impact upon any Key Fish Habitat.

## 7.3 State Environmental Planning Policy (Koala Habitat Protection) 2021

This Policy aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline. This SEPP applies to LGAs that are listed in Schedule 1 'Local government areas' of the SEPP. As the Wingecarribee LGA is included in Schedule 1, this SEPP applies to the Subject Land. As such, the development control provisions of Part 2, Clause 11 of the SEPP apply to development applications relating to the land, as the land:

- Has an area of at least 1 hectare (including adjoining land within the same ownership); and
- Does not have an approved koala plan of management applying to the land.

Before a council may grant consent to a development application for consent to carry out development on the land, the council must assess whether the development is likely to have any impact on koalas or koala habitat. If the council is satisfied that the development is likely to have low or no impact on koalas or koala habitat, the council may grant consent to the development application.

A site assessment was undertaken to determine whether the land contained core koala habitat, which is defined by the SEPP as:

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

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

Although the Subject Land contained suitable habitat (where 15% or greater of the total number of trees are the regionally relevant species of those listed in Schedule 2 of the SEPP), no signs of koala's or koala occupancy (scats, scratch marks) were observed within the Subject land and there are no Koala records within the Subject Land in the last 18 years.

Furthermore, only two (2) Koala record are located within 2.5km of the site, within the last 18 years. It was therefore determined that owing to the disturbed nature of the Subject Land and the minimal proximal records, the Subject Land is unlikely to constitute core koala habitat, and no further assessment under the SEPP (i.e. Koala Assessment Report) should be required.

# 8. Biodiversity Offset Credit Requirements

The preferred approach to offset the residual impacts of the proposal is to purchase and retire the appropriate species credits from registered Biodiversity Stewardship Sites that comply with the trading rules of the NSW BOS in accordance with the 'like for like' report generated by the BAM calculator. If such credits are unavailable, credits would be sourced in accordance with the 'variation report' generated by the BAMC.

A payment to the Biodiversity Conservation Trust (BCT) would be considered as a contingency option if a suitable number and type of biodiversity credits cannot be secured.

## 8.1 Offset Requirement for Ecosystem Credits

A total of fifty-three (53) ecosystem credit is required to offset the biodiversity impacts of the proposed subdivision (**Table 25**).

**Table 25. Ecosystem credits required to offset the proposed subdivision**

| Plant Community Type (PCT) | Total Area (ha) | BC Act Status | Ecosystem Credits Required |
|---|---|---|---|
| PCT 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion | 5.0 | Endangered | 53 |

### 8.1.1 Offset Requirement for Ecosystem Credits

One (1) Species Credit species that was confirmed within the Subject Land will require offsetting through the retiring of biodiversity offset species credits under the BOS as a result of the proposed development (**Table 26**).

**Table 26. Species credits required to offset the proposed subdivision**

| Species | Total Area of Potential Habitat | BC Act Status | Species Credits Required |
|---|---|---|---|
| *Myotis macropus* (Southern Myotis) | 1.96 | Vulnerable | 51 |

# 9. References


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# 10. Appendices

Appendix A. Flora recorded within the Subject Land.
Appendix B. Fauna recorded during survey of Subject Land.
Appendix C. BAM Site - Field Survey Forma (copied directly from Electronic Data Sheet).
Appendix D. BAMC produced Credit Summary Report. Assessor name is Chris Moore (not shown in summary report owing to technical problem in BAMC).

Appendix A. Flora recorded within the Subject Land.

| Scientific Name | Canopy | Midstory | Groundcover | Status* |
|---|---|---|---|---|
| *Acacia elata* | x | | | |
| *Acacia melanoxylon* | | x | | |
| *Acacia stricta* | | x | | |
| *Acetosella vulgaris** | | | x | High Threat Exotic |
| *Axonopus fissifolius* | | | x | High Threat Exotic |
| *Berberis spp.** | | x | | |
| *Bromus catharticus** | | | x | |
| *Brunoniella australis* | | | x | |
| *Bursaria spinosa* | | x | | |
| *Carex spp.* | | | x | |
| *Cirsium vulgare** | | | x | |
| *Daviesia ulicifolia* | | x | | |
| *Dichondra repens* | | | x | |
| *Eucalyptus cypellocarpa* | x | | | |
| *Eucalyptus globoidea* | x | | | |
| *Eucalyptus ovata* | x | | | |
| *Eucalyptus piperita* | x | | | |
| *Eucalyptus radiata* | x | | | |
| *Eucalyptus viminalis* | x | | | |
| *Glycine microphylla* | | | x | |
| *Glycine tabacina* | | | x | |
| *Goodenia hederacea* | | | x | |
| *Hardenbergia violacea* | | | x | |
| *Hypochaeris radicata** | | | x | |
| *Juncus spp.* | | | x | |
| *Lomandra filiformis* | | | x | |
| *Lomandra longifolia* | | | x | |
| *Lotus corniculatus** | | | x | |
| *Microlaena stipoides* | | | x | |
| *Oxalis perennans* | | | x | |
| *Paspalum dilatatum** | | | x | High Threat Exotic |
| *Pittosporum undulatum* | | x | | |
| *Plantago lanceolata** | | | x | |
| *Podolobium ilicifolium* | | x | | |
| *Prunus spp.** | | | x | |
| *Pteridium esculentum* | | | x | |
| *Ranunculus spp.* | | | x | |
| *Rubus fruticosus agg.** | | | x | Priority Weed |
| *Rytidosperma spp.* | | | x | |

| Scientific Name | Canopy | Midstory | Groundcover | Status* |
|---|---|---|---|---|
| *Taraxacum officinale** | | | x | |
| *Trifolium spp.** | | | x | |

** Denotes exotic species*

Appendix B. Fauna recorded during survey of Subject Land.

| Class | Scientific Name | Common Name | Status |
|---|---|---|---|
| Amphibia | *Crinia signifera* | Common Eastern Froglet | Protected |
| Amphibia | *Limnodynastes peronii* | Striped Marsh Frog | Protected |
| Amphibia | *Limnodynastes tasmaniensis* | Spotted Marsh Frog | Protected |
| Aves | *Acridotheres tristis* | Common Myna | - |
| Aves | *Alisterus scapularis* | Australian King Parrot | Protected |
| Aves | *Cacarua galerita* | Sulphur-crested Cockatoo | Protected |
| Aves | *Calyptorhynchus funereus* | Yellow-tailed Black Cockatoo | Protected |
| Aves | *Cracticus torquatus* | Grey Butcherbird | Protected |
| Aves | *Cracticus tibicen* | Australian Magpie | Protected |
| Aves | *Corvus coronoides* | Australian Raven | Protected |
| Aves | *Dacelo novaeguineae* | Laughing Kookaburra | Protected |
| Aves | *Grallina cyanoleuca* | Magpie-lark | Protected |
| Aves | *Manorina melanocephala* | Noisy Miner | Protected |
| Aves | *Platycercus elegans* | Crimson Rosella | Protected |
| Aves | *Ptilonorhynchus violaceus* | Satin Bowerbird | Protected |
| Aves | *Strepera graculina* | Pied Currawong | Protected |
| Aves | *Trichoglossus moluccanus* | Rainbow Lorikeet | Protected |
| Mammalia | *Myotis macropus* | Southern Myotis | Vulnerable (BC Act) |
| Mammalia | *Macropus giganteus* | Eastern Grey Kangaroo | Protected |
| Mammalia | *Oryctolagus cuniculus** | European Rabbit | Declared Pest |
| Mammalia | *Vulpes vulpes* | European Red Fox | Declared Pest |

Appendix C. BAM Site - Field Survey Forma (copied directly from Electronic Data Sheet).

| BAM Site – Field Survey Form | | | | | |
|---|---|---|---|---|---|
| **Date:** | 12.02.20. | **Plot ID:** | Plot 1 | | |
| **Zone:** | 56 | **Plot Dimensions:** | 20 x 50m | **Easting:** | 253200.97 E |
| **Datum:** | GDA94 | **Middle bearing from 0m:** | 328 | **Northing:** | 6162680.53 S |
| **PCT:** | 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Canopy Condition) | | | | |

| Growth Form | Scientific Name | Cover | Abundance |
|---|---|---|---|
| Tree (TG) | *Eucalyptus radiata* | 50 | N/A |
| Shrub (SG) | *Daviesia ulicifolia* | 0.5 | 10 |
| Tree (TG) | *Acacia melanoxylon* | 0.1 | 2 |
| Fern (EG) | *Pteridium esculentum* | 0.5 | 15 |
| Tree (TG) | *Eucalyptus cypellocarpa* | 15 | N/A |
| Forb (FG) | *Dichondra repens* | 0.1 | 2 |
| Shrub (SG) | *Bursaria spinosa* | 0.1 | 3 |
| Grass & grasslike (GG) | *Rytidosperma spp.* | 2 | 50 |
| Forb (FG) | *Goodenia hederacea* | 0.1 | 1 |
| Grass & grasslike (GG) | *Lomandra longifolia* | 0.1 | 10 |
| Other (OG) | *Hardenbergia violacea* | 0.1 | 1 |
| Grass & grasslike (GG) | *Lomandra filiformis* | 0.5 | 20 |
| Forb (FG) | *Oxalis perennans* | 0.1 | 1 |
| Grass & grasslike (GG) | *Microlaena stipoides* | 0.1 | 20 |

| DBH | # Tree Stems Count | # Hollow Bearing Trees |
|---|---|---|
| **80+cm** | 2 | 2 |
| **50-79cm** | 3 | 2 |
| **30-49cm** | Present | 1 |
| **20-29cm** | Present | 0 |
| **10-19cm** | Present | 0 |
| **5-9cm** | Present | 0 |
| **<5cm** | Present | 0 |

| Length of Logs (m) | 130 |
|---|---|

| BAM Attribute (1x1m) | Litter Cover (%) |
|---|---|
| **1 (5m)** | 100 |

| BAM Site – Field Survey Form | |
|---|---|
| 2 (15m) | 95 |
| 3 (25m) | 95 |
| 4 (35m) | 50 |
| 5 (45m) | 25 |
| Average | 73 |

| Growth Form | Composition Data (count of native cover) | Structure Data (sum of cover) |
|---|---|---|
| Tree | 3 | 65.1 |
| Shrub | 2 | 0.6 |
| Grass | 4 | 2.7 |
| Forb | 3 | 0.3 |
| Fern | 1 | 0.5 |
| Other | 1 | 0.1 |
| High Threat Exotics | 0 | 0 |

| BAM Site – Field Survey Form | | | | | |
|---|---|---|---|---|---|
| **Date:** | 12.02.20. | **Plot ID:** | Plot 3 | | |
| **Zone:** | 56 | **Plot Dimensions:** | 20 x 50m | **Easting:** | 253093.37 m E |
| **Datum:** | GDA94 | **Middle bearing from 0m:** | 294 | **Northing:** | 6162659.78 m S |
| **PCT:** | 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Grassland Condition) | | | | |

| Growth Form | Scientific Name | Cover | Abundance |
|---|---|---|---|
| High Threat Exotic | Paspalum dilatatum | 10 | N/A |
| Exotic | Hypochaeris radicata | 0.1 | 1 |
| Grass & grasslike (GG) | Microlaena stipoides | 7 | N/A |
| High Threat Exotic | Axonopus fissifolius | 0.1 | 10 |
| Exotic | Cirsium vulgare | 0.1 | 1 |
| Grass & grasslike (GG) | Lomandra filiformis | 10 | N/A |
| Exotic | Plantago lanceolata | 0.1 | 2 |
| Exotic | Taraxacum officinale | 0.1 | 1 |

| DBH | # Tree Stems Count | # Hollow Bearing Trees |
|---|---|---|
| **80+cm** | Absent | 0 |
| **50-79cm** | Absent | 0 |
| **30-49cm** | Absent | 0 |
| **20-29cm** | Absent | 0 |
| **10-19cm** | Absent | 0 |
| **5-9cm** | Absent | 0 |
| **<5cm** | Absent | 0 |

| Length of Logs (m) | 0 |
|---|---|

| BAM Attribute (1x1m) | Litter Cover (%) |
|---|---|
| **1 (5m)** | 20 |
| **2 (15m)** | 35 |
| **3 (25m)** | 20 |
| **4 (35m)** | 80 |
| **5 (45m)** | 85 |
| **Average** | 48 |

| BAM Site – Field Survey Form | | |
|---|---|---|
| Growth Form | Composition Data (count of native cover) | Structure Data (sum of cover) |
| Tree | 0 | 0 |
| Shrub | 0 | 0 |
| Grass | 2 | 17 |
| Forb | 0 | 0 |
| Fern | 0 | 0 |
| Other | 0 | 0 |
| High Threat Exotics | 2 | 10.1 |

| BAM Site – Field Survey Form | | | | | |
|---|---|---|---|---|---|
| **Date:** | 12.02.20. | **Plot ID:** | Plot 4 | | |
| **Zone:** | 56 | **Plot Dimensions:** | 20 x 50m | **Easting:** | 253236.12 E |
| **Datum:** | GDA94 | **Middle bearing from 0m:** | 64 | **Northing:** | 6162563.68 S |
| **PCT:** | 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Grassland Condition) | | | | |

| Growth Form | Scientific Name | Cover | Abundance |
|---|---|---|---|
| Fern (EG) | *Pteridium esculentum* | 35 | N/A |
| High Threat Exotic | *Paspalum dilatatum* | 25 | N/A |
| Grass & grasslike (GG) | *Juncus spp.* | 0.1 | 15 |
| High Threat Exotic | *Axonopus fissifolius* | 0.5 | 20 |
| Exotic | *Taraxacum officinale* | 0.1 | 10 |
| Grass & grasslike (GG) | *Microlaena stipoides* | 1 | 50 |
| Grass & grasslike (GG) | *Rytidosperma spp.* | 25 | N/A |
| High Threat Exotic | *Rubus fruticosus agg.* | 0.1 | 1 |
| High Threat Exotic | *Acetosella vulgaris* | 0.1 | 3 |
| Exotic | *Cirsium vulgare* | 0.1 | 2 |
| Grass & grasslike (GG) | *Lomandra longifolia* | 0.1 | 1 |
| Grass & grasslike (GG) | *Carex spp.* | 0.5 | 20 |
| Exotic | *Plantago lanceolata* | 0.1 | 5 |
| Exotic | *Trifolium spp.* | 0.1 | 1 |
| Grass & grasslike (GG) | *Lomandra filiformis* | 0.5 | 10 |
| Exotic | *Lotus corniculatus* | 0.1 | 1 |

| DBH | # Tree Stems Count | # Hollow Bearing Trees |
|---|---|---|
| **80+cm** | Absent | 0 |
| **50-79cm** | Absent | 0 |
| **30-49cm** | Absent | 0 |
| **20-29cm** | Absent | 0 |
| **10-19cm** | Absent | 0 |
| **5-9cm** | Absent | 0 |
| **<5cm** | Absent | 0 |

| Length of Logs (m) | 3 |
|---|---|

| BAM Attribute (1x1m) | Litter Cover (%) |
|---|---|
| 1 (5m) | 10 |
| 2 (15m) | 40 |
| 3 (25m) | 20 |
| 4 (35m) | 5 |
| 5 (45m) | 60 |
| Average | 27 |

| Growth Form | Composition Data (count of native cover) | Structure Data (sum of cover) |
|---|---|---|
| Tree | 0 | 0 |
| Shrub | 0 | 0 |
| Grass | 6 | 27.2 |
| Forb | 0 | 0 |
| Fern | 1 | 35 |
| Other | 0 | 0 |
| High Threat Exotics | 4 | 25.7 |

| BAM Site – Field Survey Form | | | | | |
|---|---|---|---|---|---|
| **Date:** | 12.02.20. | **Plot ID:** | Plot 5 | | |
| **Zone:** | 56 | **Plot Dimensions:** | 20 x 50m | **Easting:** | 253291.59 E |
| **Datum:** | GDA94 | **Middle bearing from 0m:** | 146 | **Northing:** | 6162482.57 S |
| **PCT:** | 944: Mountain Grey Gum – Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion (Canopy Condition) | | | | |

| Growth Form | Scientific Name | Cover | Abundance |
|---|---|---|---|
| Tree (TG) | *Eucalyptus radiata* | 25 | N/A |
| Tree (TG) | *Eucalyptus globoidea* | 15 | N/A |
| Tree (TG) | *Eucalyptus ovata* | 5 | 1 |
| Forb (FG) | *Dichondra repens* | 0.1 | 50 |
| Grass & grasslike (GG) | *Microlaena stipoides* | 2 | 50 |
| Grass & grasslike (GG) | *Rytidosperma spp.* | 5 | 50 |
| Grass & grasslike (GG) | *Lomandra filiformis* | 5 | 50 |
| Other (OG) | *Glycine tabacina* | 0.1 | 2 |
| Fern (EG) | *Pteridium esculentum* | 1 | 10 |
| Shrub (SG) | *Daviesia ulicifolia* | 2 | 20 |
| Shrub (SG) | *Acacia stricta* | 0.5 | 5 |
| Forb (FG) | *Brunoniella australis* | 0.1 | 2 |
| Tree (TG) | *Acacia elata* | 10 | 1 |
| Tree (TG) | *Eucalyptus cypellocarpa* | 30 | N/A |
| Shrub (SG) | *Podolobium ilicifolium* | 0.1 | 1 |
| Tree (TG) | *Acacia melanoxylon* | 5 | 1 |

| DBH | # Tree Stems Count | # Hollow Bearing Trees |
|---|---|---|
| **80+cm** | 2 | 1 |
| **50-79cm** | 2 | 0 |
| **30-49cm** | Present | 0 |
| **20-29cm** | Present | 0 |
| **10-19cm** | Present | 0 |
| **5-9cm** | Present | 0 |
| **<5cm** | Present | 0 |

| Length of Logs (m) | 35 |
|---|---|

| BAM Attribute (1x1m) | Litter Cover (%) |
|---|---|
| 1 (5m) | 95 |
| 2 (15m) | 100 |
| 3 (25m) | 20 |
| 4 (35m) | 45 |
| 5 (45m) | 100 |
| Average | 72 |

| Growth Form | Composition Data (count of native cover) | Structure Data (sum of cover) |
|---|---|---|
| Tree | 6 | 90 |
| Shrub | 3 | 2.6 |
| Grass | 3 | 12 |
| Forb | 2 | 0.2 |
| Fern | 1 | 1 |
| Other | 1 | 0.1 |
| High Threat Exotics | 0 | 0 |

Appendix D. BAMC produced Credit Summary Report. Assessor name is Chris Moore (not shown in summary report owing to technical problem in BAMC).

# BAM Credit Summary Report

## Proposal Details

| | | |
|---|---|---|
| Assessment Id | Proposal Name | BAM data last updated * |
| 00019491/BAAS19040/20/00019492 | Erith St Bundanoon | 16/06/2022 |
| Assessor Name | Report Created | BAM Data version * |
| | 04/08/2022 | 54 |
| Assessor Number | BAM Case Status | Date Finalised |
| BAAS21009 | Finalised | 04/08/2022 |
| Assessment Revision | Assessment Type | BOS entry trigger |
| 1 | Part 4 Developments (General) | BOS Threshold: Area clearing threshold |

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

## 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|

| Mountain Grey Gum - Narrow-leaved Peppermint grassy woodland on shales of the Southern Highlands, southern Sydney Basin Bioregion | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 944_Zone 1_Canopy | Southern Highlands Shale Woodlands in the Sydney Basin Bioregion | 51.2 | 49.9 | 2.1 | PCT Cleared - 84% | High Sensitivity to Potential Gain | Endangered Ecological Community | Critically Endangered | 2.00 | TRUE | 53 |
| 2 | 944_Zone 2_Grassland | Southern Highlands Shale Woodlands in the Sydney Basin Bioregion | 13.8 | 13.8 | 2.9 | PCT Cleared - 84% | High Sensitivity to Potential Gain | Endangered Ecological Community | Critically Endangered | 2.00 | TRUE | 0 |
| | | | | | | | | | | | **Subtotal** | **53** |
| | | | | | | | | | | | **Total** | **53** |

## 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 )*** | | | | | | | | | |
| 944_Zone1_Canopy | 49.9 | 49.9 | 2 | | | Vulnerable | Not Listed | False | 51 |
| | | | | | | | | **Subtotal** | **51** |

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