



## Marulan Estates Subdivision – Stage 3

### Biodiversity Development Assessment Report

Final 01 – 12 December 2023  
Prepared for Darraby Pty Ltd

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We acknowledge the Traditional Custodians of the land on which we work. We pay our respects to Elders past and present.

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## Executive Summary

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Darraby Pty Ltd (Darraby) is currently progressing the planning and approval process for Stage 3 of the Marulan Estates subdivision in portions of Lot 23 DP1256090, Marulan, NSW (the 'proposed development' of the 'subject land'). Capital Ecology Pty Ltd (Capital Ecology) has been commissioned by Darraby to complete the necessary biodiversity surveys and prepare this Biodiversity Development Assessment Report (BDAR) to identify and assess the significance of the impacts that the proposed development will have on the biodiversity values of the study area.

### Scope

Although general biodiversity values are identified and considered, the primary purpose of this BDAR is to present the results of Capital Ecology's application of the NSW Biodiversity Assessment Method (BAM) to assess the significance of the impacts of the proposed development on biota listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act). This BDAR also includes assessment of the potential impacts of the proposed development on Matters of National Environmental Significance (MNES) listed pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The 'study area' for this BDAR is defined as all of Lot 23 DP1256090 and encompasses an area of 97.01 ha. Portions of the study area were assessed by Capital Ecology in 2019 and 2020. Ecological data of relevance from these previous assessments have been included in this BDAR.

The 'subject land' for this BDAR includes the 'development area' of Stage 3 of the Marulan Estates Subdivision and the crown road reserve adjoining the north-east corner of Lot 23 DP1256090. The subject land is 14.12 ha and encompasses approximately 15% of Lot 23 DP1256090, including the additional 0.42 ha of crown road reserve. The subject land for this BDAR relates only to the portion of the study area that will be impacted by the proposed development.

### Survey Overview

Vegetation and potential flora/fauna habitat were surveyed and mapped in accordance with the BAM. This BDAR includes data from the following seven ecological surveys performed by Capital Ecology between 26 July 2019 and 4 December 2019 for a previous BDAR that included a portion of the subject land. Plant Community Type (PCT) mapping, Vegetation Zone mapping, and BAM plots were resurveyed on 11 July 2022 to ensure the current ecological values are reflected in this BDAR.

- PCT and Vegetation Zone assessment and mapping.
- BAM plots.
- A tree habitat assessment.
- Threatened flora surveys via transect surveys and opportunistic observations.
- Threatened bird surveys via areas searches and opportunistic observations.
- A fauna nesting survey via inspections of each tree for signs of fauna breeding in hollows or nests.
- Nocturnal fauna surveys via spotlighting and call playback in likely habitat.

## Results

### Native vegetation

This high degree of vegetation modification makes accurate identification of the PCT difficult. Of the trees which remain (estimated to be 11% of those which occurred before European settlement), the dominant overstorey species are Thin-leaved Stringybark *E. eugenioides* and Cabbage Gum *E. amplifolia*, with Blue-leaved Stringybark *E. agglomerata* and Yellow Box *E. melliodora* occurring as sub-dominant or associate species in the crown road reserve which comprises the eastern in extent of the subject land. There are also a small number of Candlebark *E. rubida*, Apple Box *E. bridgesiana*, and Argyle Apple *E. cinerea* scattered across the study area.

The NSW Vegetation Information System (VIS) PCT data power query excel spreadsheet was interrogated using the following filters:

- IBRA – contains ‘South Eastern Highlands’;
- IBRA Subregion – contains ‘Bungonia’; and
- Vegetation Formation – contains ‘Grassy Woodlands’ or ‘Dry Sclerophyll Forests (Shrub/grass sub-formation)’.

This process resulted in 37 candidate PCTs and an additional 38 decommissioned PCTs. Of those candidate PCTs, PCT3486 contains the most appropriate upper stratum species in both ‘median cover score’ and ‘frequency’ as listed in the NSW VIS.

The newly released NSW State Vegetation Type Map (SVTM) has mapped five PCTs as occurring in the study area. While ‘PCT3376 - Southern Tableland Grassy Box Woodland’ is mapped across most the study area in the SVTM, PCT3486 is mapped in adjacent areas and is considered more appropriate when considering landscape position, vegetation formation, and species composition, particularly in the more intact vegetation found in the crown road reserve (PCT3486 Zone 1).

In light of the above, it is concluded that before European occupation the subject land is likely to have been characterised by a single grassy open forest PCT, being ‘PCT3486 – Wollondilly-Shoalhaven Slopes Grassy Open Forest’.

Before European occupation, the entire subject land would have been characterised by this grassy open forest. However, the majority subject land has been substantially cleared and modified by its current and past land use, which has primarily been grazing (sheep, cattle, horses, and pigs) and some cropping. This has led to extensive clearing of the native woody overstorey, midstorey, and shrubstorey across approximately 89% of the subject land. This cleared land has been cultivated and sown to cereal crops or pasture. The patches in the subject land with a retained woody overstorey have still been substantially modified by historic clearing and agricultural activities and lack a midstorey, shrubstorey, and native groundstorey.

In addition to the above, the portion of the subject land located in the Goulburn Street road reserve supports the grassy open forest community in relatively intact form, with a canopy of Apple Box, Thin-leaved Stringybark, and Argyle Apple *E.*, with scattered Yellow Box, Cabbage Gum, and Black She-oak *Allocasuarina littoralis*. There are some scattered shrubs and regeneration of the canopy. Whilst this area is still moderately disturbed and contains some common weeds, the groundlayer is dominated by perennial native grasses (particularly Kangaroo Grass *Themeda triandra* and Rough Speargrass *Austrostipa scabra*) with a moderate to high diversity of forbs.

### Threatened ecological communities

No part of the subject land supports, or is estimated to have historically supported, an EPBC Act or BC Act listed threatened ecological community.

### Threatened species

The historic activities which have occurred across the majority of the subject land have substantially degraded the habitat value for native flora and fauna. Therefore, the subject land is considered unlikely to support habitat for many of the threatened flora or threatened fauna species that have the potential to occur in the locality. As assessed via a variety of field surveys, no threatened flora or fauna species were found to occupy the subject land.

One listed threatened species, *Leucochrysum albicans* var. *tricolor* (BC Act / EPBC Act endangered), was recorded within the wider study area. In total, the study area was assessed as supporting 0.62 ha of Hoary Sunray habitat, comprised of 0.34 ha in south-western corner of Lot 23 DP1256090 and 0.28 ha in the north-western corner. The proposed development of the subject land will not impact either population of Hoary Sunray.

### Impacts

#### Native vegetation

The proposed development will result in the clearance of the following native vegetation.

- 0.21 ha of PCT3486 Zone 1 – canopy, regeneration, native dominant understorey, moderate native forb diversity (BC Act native vegetation).
- 1.31 ha of PCT3486 Zone 3 – canopy, exotic dominant understorey, low native forb diversity (BC Act native vegetation).

In total, the proposed development will result in the clearance of 1.52 ha of BC Act native vegetation.

The proposed development will also result in the clearance of:

- 12.38 ha of PCT3486 Zone 4 – low diversity exotic pasture.

The 12.38 ha of PCT3486 Zone 4 is clearly dominated by exotic grasses and forbs, does not meet the definition of BC Act native vegetation, and is not identified as habitat for threatened species. Therefore, in accordance with the BAM, PCT3486 Zone 4 does not require further assessment with respect to ecosystem credits or species credits.

The proposed development will not result in any other direct impacts on native vegetation and is unlikely to result in biodiversity impacts that are unforeseen or uncertain.

### Assessment and Approval Requirements

#### Commonwealth EPBC Act

The proposed development is unlikely to have a significant impact on an EPBC Act listed MNES given the subject land does not:

- support any EPBC Act listed ecological communities;
- support any EPBC Act listed flora species; or



- contain habitat of potential importance to EPBC Act listed threatened or migratory fauna species.

In light the above, EPBC Act referral is unwarranted and is not recommended.

### NSW BC Act – Biodiversity offset credit calculations

The proposed development will involve the clearance of one vegetation zone which has a vegetation integrity score sufficient for its clearance to generate ecosystem credits:

- PCT3468 Zone 1 – clearance of 0.21 ha which generates 4 ecosystem credits.

The subject land does not support habitat of potential significance to any species credit species. Accordingly, the proposed development does not generate a species credit obligation.

### NSW Koala SEPP – Koala Habitat Protection Requirements

The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (the 'Biodiversity and Conservation SEPP 2021') commenced on 1 March 2022 consolidating and replacing eleven former SEPPs, including the former *State Environmental Planning Policy (Koala Habitat Protection) 2021*.

'Chapter 4 Koala habitat protection 2021' of the *Biodiversity and Conservation SEPP 2021* –

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

In summary, while the areas of intact vegetation located over 7.5 km to the east of the subject land may support a Koala population, the subject land is likely to be functionally isolated from that potential habitat by highly degraded agricultural land, urban development, and the Hume Highway. Additionally, the subject land has undergone extensive historical vegetation clearance, is subject to ongoing disturbance, and does not contain substantial areas of habitat required to support a Koala population. As such, the subject land does not support habitat features of value to the Koala and is not considered core Koala habitat.

Whilst the development control provisions of Chapter 4 apply to the proposed development, the subject land is considered unlikely to constitute important or occupied Koala habitat now or in the future. Council can therefore be satisfied that the proposed development is unlikely to have any impact on Koalas or Koala habitat and may grant consent to the development application.

# 1 Introduction

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Darraby Pty Ltd (Darraby) is currently progressing the planning and approval process for Stage 3 of the Marulan Estates subdivision in portions of Lot 23 DP1256090, Marulan, NSW (the 'proposed development' of the 'subject land'). Capital Ecology Pty Ltd (Capital Ecology) has been commissioned by Darraby to complete the necessary biodiversity surveys and prepare this Biodiversity Development Assessment Report (BDAR) to identify and assess the significance of the impacts that the proposed development will have on the biodiversity values of the study area.

Although general biodiversity values are identified and considered, the primary purpose of this BDAR is to present the results of Capital Ecology's application of the NSW Biodiversity Assessment Method (BAM) (NSW Government 2020a<sup>1</sup>) to assess the significance of the impacts of the proposed development on biota listed as threatened under the NSW *Biodiversity Conservation Act 2016* (BC Act). This BDAR also includes assessment of the potential impacts of the proposed development on Matters of National Environmental Significance (MNES) listed pursuant to the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

## 1.1 Study area and Subject land

The 'study area' for this BDAR is defined as all of Lot 23 DP1256090 and encompasses an area of 97.01 ha. Portions of the study area were assessed by Capital Ecology in 2019 and 2020<sup>2</sup>. Ecological data of relevance from these previous assessments have been included in this BDAR.

The 'subject land' for this BDAR includes the 'development area' of Stage 3 of the Marulan Estates Subdivision, together with the crown road reserve adjoining the north-east corner of Lot 23 DP1256090. The subject land is 14.12 ha and encompasses approximately 15% of Lot 23 DP1256090, including the additional 0.42 ha of crown road reserve. The subject land for this BDAR relates only to the portion of the study area that will be impacted by the proposed development (Figure 1, Figure 2, and Figure 3).

As shown in Figure 1 and Figure 3, the subject land is bordered by:

- the Main South Line train line to the north;
- partially cleared agricultural land within the study area to the south, beyond which is the Hume Highway and then partially cleared agricultural land;
- partially cleared agricultural land within the study area to the west; and
- Stage 1 and Stage 2 (DA approved) of Marulan Estates to the southeast, beyond which is Wilson Drive and existing urban development.

Located in the Goulburn Mulwaree Local Government Area (LGA), pursuant to the *Goulburn Mulwaree Local Environment Plan 2009* (LEP), the subject land is zoned<sup>3</sup> 'R1 General Residential' with minimum lot size<sup>4</sup> of 'E = 350 m<sup>2</sup>' to 'Q = 700 m<sup>2</sup>' and 'RU6 – Transition' with minimum lot size

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<sup>1</sup> NSW Government (2020a). *Biodiversity Assessment Method*. NSW Department of Planning, Industry and Environment. Published October 2020

<sup>2</sup> Capital Ecology (2020). *Marulan Estates Subdivision – Stage 3 – Biodiversity Development Assessment Report*. Draft 01 – September 2020. Prepared for Darraby Pty Ltd. Authors: S. Reid, S. Thompson, and R. Speirs. Project no. 2991.

<sup>3</sup> Goulburn Mulwaree Local Environment Plan 2009. *Land Zoning Map - Sheet LZN\_003C*.

<sup>4</sup> Goulburn Mulwaree Local Environment Plan 2009. *Lot Size Map - Sheet LSZ\_003C*.

of 'AD = 100 ha'. The crown road reserve of Goulburn Street is zoned 'RE1 – Public Recreation' and does not have an associated minimum lot size. The remainder of the study area is zoned 'R1 – General Residential', 'IN2 – Light Industrial', and 'RU6 – Transition'.

The south-western corner of the subject land is identified on the Goulburn Mulwaree LEP Terrestrial Biodiversity Map<sup>5</sup>. The study area is not identified on the NSW Government Biodiversity Values Map<sup>6</sup>.

The topography across the subject land is gently flat, with the elevation ranging from approximately 660 m Australian Height Datum (AHD) in the south-western corner to 650 m AHD across the remainder of the subject land.

The built infrastructure in the subject land is restricted to existing boundary and internal fences, which are in a generally functional condition.

The subject land contains one drainage line that joins with a tributary that flows 250 m north to Jaorimin Creek (Figure 4). The wider study area supports additional drainage lines / tributaries, which join together and flow north into Jaorimin Creek or south and ultimately into Marulan Creek. The tributaries and drainage lines did not support any native or exotic riparian vegetation, were dry at the time of survey, and are only likely to convey water following substantial rain events. There are seven small to moderately sized dams in the study area, one of which occurs in the subject land. All of the dams held water at the time of survey.

Before European occupation, the entire subject land would have been characterised by a grassy open forest. However, the majority subject land has been substantially cleared and modified by its current and past land use, which has primarily been grazing (sheep, cattle, horses, and pigs) and some cropping. This has led to extensive clearing of the native woody overstorey, midstorey, and shrubstorey across approximately 89% of the subject land. This cleared land has been cultivated and sown to cereal crops or pasture. The patches in the subject land with a retained woody overstorey have still been substantially modified by historic clearing and agricultural activities and lack a midstorey, shrubstorey, and native groundstorey.

In addition to the above, the portion of the subject land located in the Goulburn Street road reserve supports the grassy open forest community in relatively intact form, with a canopy of Apple Box *Eucalyptus bridgesiana*, Thin-leaved Stringybark *E. eugenioides*, and Argyle Apple *E. cinerea*, with scattered Yellow Box *E. melliodora*, Cabbage Gum *E. amplifolia*, and Black She-oak *Allocasuarina littoralis*. There are some scattered shrubs and regeneration of the canopy. Whilst this area is still moderately disturbed and contains some common weeds, the groundlayer is dominated by perennial native grasses (particularly Kangaroo Grass *Themeda triandra* and Rough Speargrass *Austrostipa scabra*) with a moderate to high diversity of forbs.

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<sup>5</sup> Goulburn Mulwaree Local Environment Plan 2009. *Terrestrial Biodiversity Map - Sheet BIO\_003*.

<sup>6</sup> <https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap>

## 1.2 Previous Studies

Capital Ecology (2017<sup>7</sup>), Capital Ecology (2019a<sup>8</sup>), Capital Ecology (2019b<sup>9</sup>), and Capital Ecology (2020<sup>10</sup>) have previously investigated the biodiversity values of the subject land and surrounding portions of Lot 23 DP1256090. These reports agree on the key ecological values which are likely/unlikely to occur, being the following.

- The vegetation across the subject land is highly modified as it has been historically cleared, intensively grazed, and cultivated/pasture improved. The vegetation is generally characterised by a low diversity exotic groundstorey, an absent midstorey and shrubstorey, and scattered remnant trees or patches of trees.
- Many of the remnant trees in the subject land are dead or dying, presumably due to stock damage.
- The eastern half of Lot 23 DP1256090 (which includes the subject land) has been modified to the extent that it is unlikely to support any of the threatened flora or threatened fauna which have the potential to occur in the locality.
- The western half of Lot 23 DP1256090 (which does not include the subject land but does include the western portion of the study area) contains substantial patches of more intact remnant vegetation which may support a number of the threatened flora or threatened fauna that have the potential to occur in the locality (refer to Figure 2). Hoary Sunray *Leucochrysum albicans* var. *tricolor* (BC Act / EPBC Act endangered) has been recorded in a number of these patches of remnant vegetation (refer to Figure 9).

## 1.3 Proposed Development

The proposed development consists of the following elements (refer to Figure 2 and Figure 3).

- Site infrastructure works, including:
  - Demolition, vegetation clearing and removal of existing farm dams.
  - Bulk earthworks to establish residential lots and box out for proposed road network.
  - Construction of internal roads including kerb and gutter, vehicle pavement footpaths and verge landscaping.
  - Construction of stormwater infrastructure, utility services and landscaping.
- Implementation of construction-phase erosion and sediment controls.

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<sup>7</sup> Capital Ecology (2017). *Lot 1 DP221236 Marulan NSW – Ecological Values and Constraints Assessment*. February 2017. Prepared for FDC Construction & Fitout (NSW) Pty Ltd. Authors: S. Vertucci and R. Speirs. Project no. 2722.

<sup>8</sup> Capital Ecology (2019a). *Marulan Estates Subdivision – Stage 2 – Ecological Impact Assessment*. 1 May 2019. Prepared for Darraby Pty Ltd. Project no. 2865.

<sup>9</sup> Capital Ecology (2019b). *Marulan Estates Subdivision – Stage 2. Biodiversity Development Assessment Report*. Final - November 2019. Prepared for Darraby Pty Ltd. Authors: S. Reid, A. Vincent, and R. Speirs. Project no. 2865.

<sup>10</sup> Capital Ecology (2020). *Marulan Estates Subdivision – Stage 3 – Biodiversity Development Assessment Report*. Draft 01 – September 2020. Prepared for Darraby Pty Ltd. Authors: S. Reid, S. Thompson, and R. Speirs. Project no. 2991.

- Subdivision to create 125 residential lots, 1 drainage lot, and 1 residual lot.
- Extension of Goulburn Street from Portland Avenue to the site.

For the purposes of this BDAR, it is assumed that the proposed development will clear all vegetation in the subject land, including the vegetation in the Goulburn Street road reserve.

## 1.4 Commonwealth and State Assessment and Approval Processes

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

The EPBC Act is the key Commonwealth Government legislation for the protection and conservation of Australia's environment and biodiversity. The EPBC Act provides the legislative framework for the assessment and approval mechanism requiring that proposed 'actions' to be assessed in terms of their potential to impact upon 'Matters of National Environmental Significance' (MNES). MNES currently listed under the EPBC Act are:

- world heritage properties;
- national heritage places;
- wetlands of international importance (listed under the Ramsar Convention);
- threatened species and ecological communities;
- migratory species (protected under international agreements);
- Commonwealth marine areas;
- the Great Barrier Reef Marine Park;
- nuclear actions (including uranium mining); and
- a water resource, in relation to coal seam gas development and large coal mining development.

Where a potential impact on a MNES may occur as a result of a proposed action, the significance of that impact must be assessed. Guidelines for determining whether an impact is significant are provided by the Department of Climate Change, Energy, the Environment and Water (DEECCW) (Commonwealth of Australia 2013a<sup>11</sup>). If it is determined that a proposed action will, or is likely to, have a significant impact on a MNES, the action must be referred to the Commonwealth Minister for the Environment. The Department will then consider the referred action and the Minister (or his/her Delegate) will make a determination regarding whether the action requires approval under the EPBC Act and associated conditions and controls.

The following website provides further information regarding the EPBC Act referral and approval process: <http://www.environment.gov.au/epbc/index.html>

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<sup>11</sup> Commonwealth of Australia (2013a). *Matters of National Environmental Significance - Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Commonwealth Department of the Environment.

### 1.4.2 NSW Biodiversity Conservation Act 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act) commenced on 25 August 2017, the purpose of which is –

*to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development* (BC Act Part 1, Section 1.3).

The BC Act outlines the NSW framework for addressing impacts on biodiversity from development and clearing. Supported by the NSW *Biodiversity Conservation Regulation 2017* (BC Regulation), the BC Act establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS).

#### 1.4.2.1 NSW Biodiversity Offset Scheme

The BOS creates a transparent, consistent, and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity. The BOS aims to ensure a no-net-loss outcome for biodiversity by applying a framework which requires that impacts are first avoided and minimised, and where this cannot be fully achieved, residual impacts must be offset. The BOS also establishes Biodiversity Stewardship Agreements (BSAs), which are voluntary in-perpetuity agreements entered into by landholders, to secure and manage offset sites for biodiversity conservation. The two key elements of the BOS are as follows.

1. A developer, landholder etc. who undertakes an activity (i.e. development, clearing, other impact) which generates a credit obligation must retire the necessary credits to offset their activity.
2. A landholder who establishes a biodiversity stewardship site on their land generates credits which may be sold to developers or landholders who require those credits to offset their credit obligation.

Under the BC Act, the BOS is triggered for proposed development or clearing which:

- will involve clearance of native vegetation (including trees, understorey plants, groundcover plants, and wetland plants) or a prescribed impact (as set out in clause 6.1 of the BC Regulation) on land identified on the Biodiversity Values Map; and/or
- will exceed the native vegetation clearance threshold for the smallest minimum lot size associated with the subject land; and/or
- may significantly impact one or more BC Act listed entities (i.e. threatened species or ecological communities).

#### 1.4.2.2 NSW Biodiversity Assessment Method

The NSW Biodiversity Assessment Method (BAM) is the assessment manual that outlines how an accredited person (i.e. a BAM Assessor) assesses impacts on biodiversity at development sites or assesses the biodiversity values of stewardship sites. The BAM is a scientific document that provides:

- a consistent (standard) method for the assessment of the biodiversity values of a proposed development site, major project site, or vegetation clearing site, or stewardship site;

- guidance on how a proponent (i.e. developer, landholder) can avoid and/or minimise potential biodiversity impacts, or assessment of the management requirements at a proposed biodiversity stewardship site and the likely improvement in biodiversity values that are predicted to occur over time; and
- the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity values for a development site, or the number and class of biodiversity credits to be generated by a proposed stewardship site.

The BAM is supported by the online BAM Calculator, into which a BAM Assessor enters the data from desktop and field investigations to determine the number and class of biodiversity credits generated:

- as an obligation for development/clearance, this obligation must be addressed by the proponent to secure approval for the development/clearance; or
- by the establishment and management of a biodiversity stewardship site, these credits being a commodity that may be sold.

The BAM determines the following two types of credits on both development/clearance sites and stewardship sites.

- Ecosystem credits, these are credits generated for impacts on, or conservation of:
  - threatened ecological communities; and
  - threatened species habitat for species that can be reliably predicted to occur within a given plant community type (PCT) (referred to in the BAM as 'ecosystem credit species').
- Species credits, these are credits generated for impacts on, or conservation of, individuals and/or the habitat of threatened species which cannot be reliably predicted to occur in a given PCT (referred to in the BAM as 'species credit species').

The BAM Assessor documents the results of the biodiversity assessment in a Biodiversity Assessment Report (BAR), of which there are the following three types.

- Biodiversity Development Assessment Report (BDAR). A BDAR is developed to assess the likely biodiversity impacts of a development or vegetation clearing proposal.
- Biodiversity Certification Assessment Report (BCAR). A BCAR is developed to assess the likely biodiversity impacts of conferring biodiversity certification over a specific area of land.
- Biodiversity Stewardship Site Assessment Report (BSSAR). A BSSAR is developed to assess the likely biodiversity conservation gain of establishing a specific area of land as a biodiversity stewardship site under a formal Biodiversity Stewardship Agreement.

#### **1.4.3 NSW State Environmental Planning Policy (Koala Habitat Protection) 2021**

State Environmental Planning Policies (SEPPs) outline policy objectives relevant to state-wide issues. The *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (the 'Biodiversity and Conservation SEPP 2021') commenced on 1 March 2022 consolidating and replacing eleven former SEPPs, including the *State Environmental Planning Policy (Koala Habitat Protection) 2021*.

‘Chapter 4 Koala habitat protection 2021’ of the *Biodiversity and Conservation SEPP 2021* –

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

On land zoning and tenure located in LGAs to which Chapter 4 applies (listed in Schedule 4):

- A. on land to which an approved koala plan of management applies, the council’s determination of the development application must be consistent with the approved koala plan of management that applies to the land; or
- B. on land to which no approved koala plan of management applies, and the land has an area of at least 1 hectare (including adjoining land within the same ownership), 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.

Where Scenario B applies –

*(3) 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.*

*(4) If the council is satisfied that the development is likely to have a higher level of impact on koalas or koala habitat, the council must, in deciding whether to grant consent to the development application, take into account a koala assessment report for the development.*

*(5) However, despite subsections (3) and (4), the council may grant development consent if the applicant provides to the council—*

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

*(i) does not include any trees belonging to the koala use tree species listed in Schedule 3 for the relevant koala management area, or*

*(ii) is not core koala habitat, or*

*(b) information the council is satisfied demonstrates that the land subject of the development application—*

*(i) does not include any trees with a diameter at breast height over bark of more than 10 centimetres, or*

*(ii) includes only horticultural or agricultural plantations.*

The *Biodiversity and Conservation SEPP 2021* applies in addition to any assessments required under the EPBC Act or the BC Act (i.e. BAM assessment).

As the subject land is zoned R1 General Residential, RU6 – Transition, and RE1 – Public Recreation, is located in the Goulburn Mulwaree LGA, and has an area of at least 1 hectare, Scenario B of Chapter 4 of the *Biodiversity and Conservation SEPP 2021* applies to the proposed development.



## 1.5 Biodiversity Development Assessment Report

As prescribed under Part 6, Division 3, Section 6.12 of the BC Act, a BDAR is –

*a report prepared by an accredited person in relation to proposed development or activity that would be authorised by a planning approval, or proposed clearing that would be authorised by a vegetation clearing approval, that:*

*(a) assesses in accordance with the biodiversity assessment method the biodiversity values of the land subject to the proposed development, activity or clearing, and*

*(b) assesses in accordance with that method the impact of proposed development, activity or clearing on the biodiversity values of that land, and*

*(c) sets out the measures that the proponent of the proposed development, activity or clearing proposes to take to avoid or minimise the impact of the proposed development, activity or clearing, and*

*(d) specifies in accordance with that method the number and class of biodiversity credits that are required to be retired to offset the residual impacts on biodiversity values of the actions to which the biodiversity offsets scheme applies.*

A BDAR prepared applying the BAM by an accredited BAM Assessor must accompany any development application for which the BOS is triggered. As detailed previously, the BOS is triggered for a proposed development which:

- will involve clearance of native vegetation (including trees, understorey plants, groundcover plants, and wetland plants) or a prescribed impact (as set out in clause 6.1 of the BC Regulation) on land identified on the Biodiversity Values Map; and/or
- will exceed the native vegetation clearance threshold for the smallest minimum lot size associated with the subject land; and/or
- may significantly impact one or more BC Act listed entities (i.e. threatened species or ecological communities).

With regard to the above, the smallest minimum lot size associated with the subject land is 'E' 350 m<sup>2</sup> (LEP Lot Size Map - Sheet LSZ\_003C). Therefore, in accordance with Part 7, Clause 7.2 of the BC Regulation, if the BC Act 'native vegetation' (defined in Part 5A of the *Local Land Services Act 2013* as plant species indigenous to NSW) clearance exceeds 2,500 m<sup>2</sup> (0.25 ha) in total, then the BOS is triggered. As the proposed development will involve the clearance of approximately 1.52 ha of BC Act 'native vegetation', the BOS is triggered and a BDAR is required to assess the impacts of the proposed development.

The BAM provides a standard method for assessing the impacts of a development/clearance proposal. This theme should carry over to the resulting BDAR such that it is as concise as possible whilst still addressing all of the relevant elements of the BAM in order to provide a complete assessment of the proposed development.

### 1.5.1 Objectives and Format

Developed to reflect the format of the BAM, this BDAR comprises the following two broad parts.

- Part 1 – Biodiversity Assessment (BAM Stage 1), includes assessment of the:
  - landscape context;
  - native vegetation, threatened ecological communities (TECs), vegetation integrity; and
  - habitat suitability for threatened species.
- Part 2 – Impact Assessment (BAM Stage 2), details the:
  - proposed measures to avoid, minimise and mitigate biodiversity impacts;
  - residual impacts (direct and indirect) of the proposed development; and
  - offset requirements relevant to the proposed development.

### 1.5.2 Technical Resources and Qualifications

This BDAR has been prepared by the following technical personnel:

- Robert Speirs – Director / Principal Ecologist  
BAppSc (Ecology), DipPM, MEIANZ, CEnvP-E, Accredited BAM Assessor (No: BAAS17089)  
Robert was project manager for this assessment and completed or closely supervised all field surveys, data entry, GIS mapping, BAM credit calculations, and report preparation.
- Dr Sam Reid – Senior Ecologist  
BSc (Hons), PhD, MEIANZ, Accredited BAM Assessor (No: BAAS20006)  
Sam undertook field surveys, GIS Mapping, BAM credit calculations, and report preparation.
- Dr Catherine Ross – Consultant Ecologist  
BSc (Hons), PhD  
Catherine undertook field surveys, data entry, GIS mapping, BAM credit calculations, and report preparation.
- Shannon Thompson – Spatial Ecologist  
BSc  
Shannon undertook field surveys, data entry, GIS mapping, BAM credit calculations, and report preparation.


All surveys for this assessment were undertaken in accordance with the following.

- Capital Ecology's (Robert Speirs – Principal Investigator) Animal Research Authority (ARA) granted under the NSW *Animal Research Act 1985* by the Animal Care and Ethics Committee of the Secretary of the Department of Regional NSW (CSB 15/2046).
- Capital Ecology's NSW Scientific Licence issued by the NSW Department of Planning and Environment under Part 2 of the NSW *Biodiversity Conservation Act 2016* (SL101623).

### 1.5.3 Certification under clause 6.15 of the Biodiversity Conservation Act 2016

I certify that this report has been prepared based on the requirements of, and information provided under, the NSW Biodiversity Assessment Method 2020 and clause 6.15 of the NSW *Biodiversity Conservation Act 2016*.

**Name:** Robert Speirs

**Signature:** 

**Date:** 12 December 2023

**BAM Assessor Accreditation no:** BAAS17089

### 1.5.4 Conflict of interest declaration

I declare that I have considered the circumstances and there is no actual, perceived or potential conflict of interest.

This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.



**Name:** Robert Speirs

**Signature:** 

**Date:** 12 December 2023

**BAM Assessor Accreditation no:** BAAS17089

# Legend

-  Subject Land - Stage 3
-  Study Area - Lot 23 DP1256090

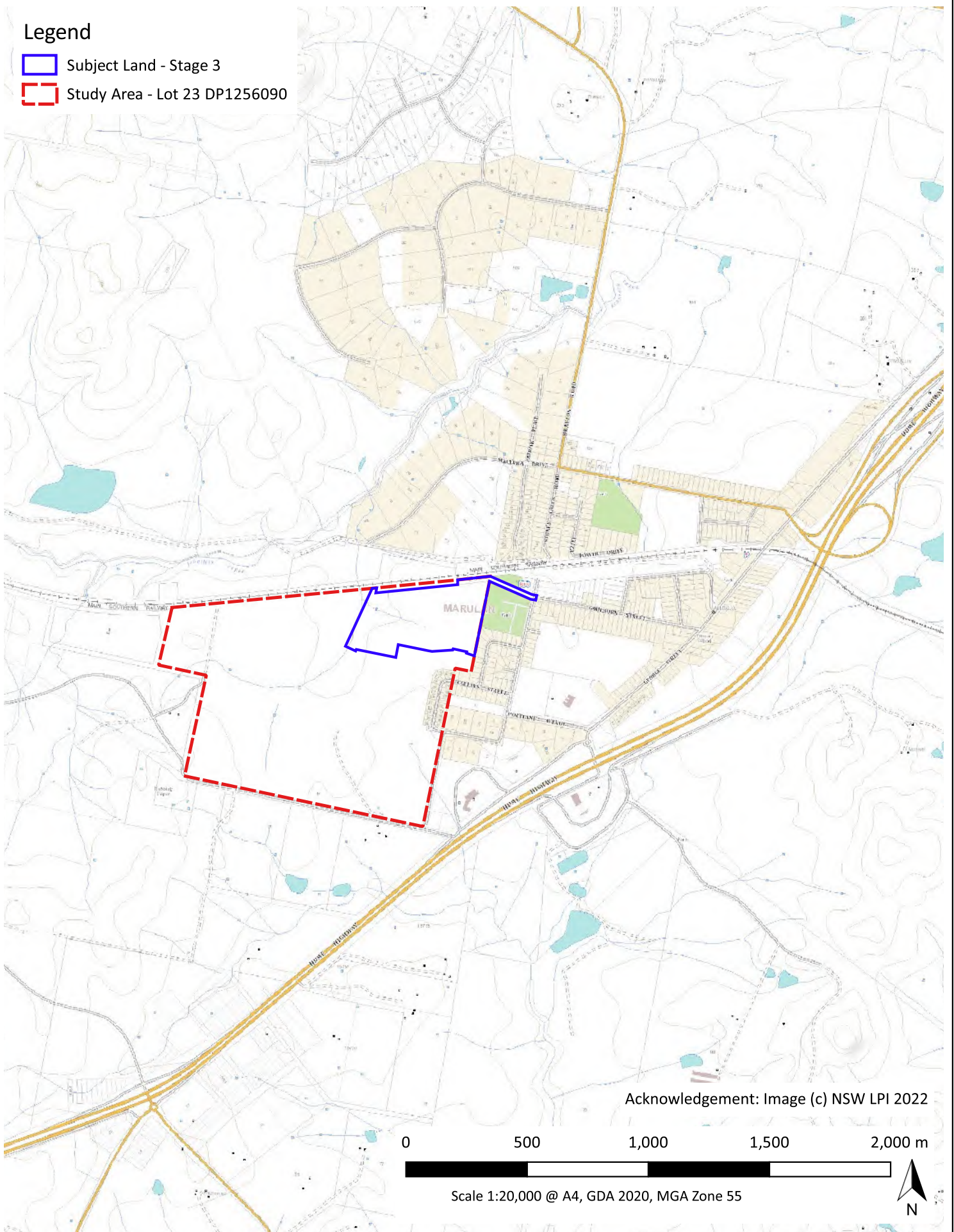
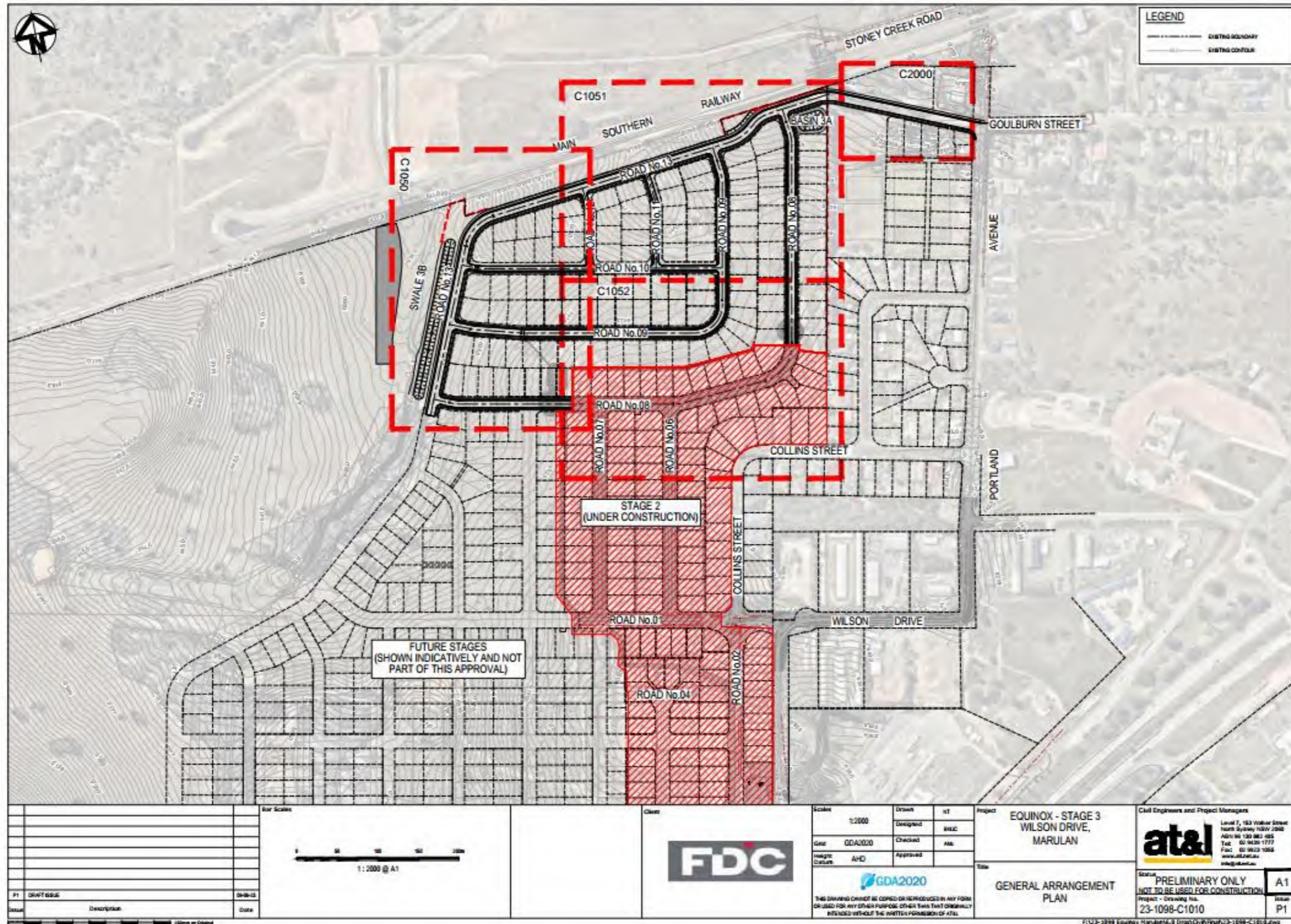


Figure 1. Locality Plan

Capital Ecology Project No: 3148  
Drawn by: C. Ross  
Date: 27 June 2023



Figure 2. The Proposed Development



Legend

Study Area - Lot 23 DP1256090

Subject Land - Stage 3

Lot Layout Stage 3 - June 2023



Figure 3. Proposed Development Impact Area on Aerial Imagery

Capital Ecology Project No: 3148  
Drawn by: C. Ross  
Date: 27 June 2023



## 2 Part 1 – Biodiversity Assessment (BAM Stage 1)

Part 1 of this BDAR provides an assessment of the biodiversity values of the subject land as set out in Stage 1 of the BAM.

### 2.1 Landscape Context

As detailed in Chapter 3 of the BAM, a range of landscape features must be identified where they occur in the subject land or within the assessment area surrounding the subject land. These features may contain/support biodiversity values that are important for the site context of the subject land, or for informing the likely habitat suitability of the subject land. Table 1 outlines the landscape features and overall landscape context of relevance to the subject land and wider subject land.

As stated in Section 1.1, the ‘subject land’ only relates to the portions of the ‘study area’ area which will be impacted by the proposed development (Figure 1 and Figure 3).

**Table 1. Landscape features.**

Landscape Feature	Description	Figure Reference
IBRA bioregion	The subject land occurs in the <b>South Eastern Highlands</b> IBRA bioregion.	-
IBRA subregion	The subject land occurs in the <b>Bungonia</b> IBRA subregion.	-
BioNet NSW landscapes (Mitchell landscapes)	The subject land contains one Mitchell Landscape: <b>Bungonia Tableland and Gorge</b> .	Figure 1
Rivers, streams and estuaries (Strahler <sup>12</sup> stream order)	<p>The subject land contains one 1<sup>st</sup> order drainage line (defined based on the NSW LPI Hydrology Map and as per Appendix 3 of the BAM) that joins with a tributary that flows 250 m north to Jaorimin Creek. The wider study area supports additional drainage lines / tributaries, which join together and flow north into Jaorimin Creek or south and ultimately into Marulan Creek.</p> <p>The tributaries and drainage lines did not support any native or exotic riparian vegetation and were dry at the time of survey, and are only likely to convey water following substantial rain events. The lack of permanent water and riparian vegetation indicates that the tributaries and drainage lines are unlikely to provide habitat of significance to aquatic/riparian flora or fauna.</p> <p>There are seven small to moderately sized dams in the study area, one of which occurs in the subject land. All of the dams held a small amount of water at the time of survey and are only likely to be of limited value to the common native water birds, reptiles, and amphibians which occur in the locality.</p>	Figure 4 Figure 6
Wetlands (important wetlands)	The study area does not contain any important wetlands as listed in the Directory of Important Wetlands in Australia (DIWA) or coastal wetlands protected under <i>State Environmental Planning Policy No 14</i> .	-
Connectivity	Before European occupation, the entire subject land would have been characterised by a grassy open forest. However, the majority subject land	Figure 5

<sup>12</sup> Strahler, AN (1952). *Hypsometric (area-altitude) analysis of erosional topology*. Geological Society of America Bulletin 63 (11): 1117–1142.

Landscape Feature	Description	Figure Reference
	<p>has been substantially cleared and modified by its current and past land use, which has primarily been grazing (sheep, cattle, horses, and pigs) and some cropping. This has led to extensive clearing of the native woody overstorey, midstorey, and shrubstorey across approximately 89% of the subject land. This cleared land has been cultivated and sown to cereal crops or pasture. The patches in the subject land with a retained woody overstorey have still been substantially modified by historic clearing and agricultural activities and lack a midstorey, shrubstorey, and native groundstorey.</p> <p>In addition to the above, the portion of the subject land located in the Goulburn Street road reserve supports the grassy open forest community in relatively intact form, with a canopy of Apple Box, Thin-leaved Stringybark, and Argyle Apple, with scattered Yellow Box, Cabbage Gum, and Black She-oak. There are some scattered shrubs and regeneration of the canopy. Whilst this area is still moderately disturbed and contains some common weeds, the groundlayer is dominated by perennial native grasses (particularly Kangaroo Grass and Rough Speargrass) with a moderate to high diversity of forbs.</p> <p>The majority of the vegetation in the study area (and all of the vegetation that occurs in the subject land) is therefore characterised by an absent or low-density canopy of mature remnant eucalypts, an absent midstorey and shrubstorey, and a low diversity groundstorey dominated by exotic grasses and weeds.</p> <p>Finally, the study area is bordered by Marulan township to the east and by partially cleared agricultural land to the north, south, and west. While much of the native overstorey has been removed throughout the locality, substantial patches of remnant vegetation occur within 2 km to 5 km of the study area.</p> <p>In light of the above, while the patches of remnant trees and native and exotic pasture in the subject land and wider study area are likely to be of some habitat value to a variety of native fauna, the subject land is unlikely to constitute or comprise part of an important biodiversity corridor or other notable habitat connectivity feature.</p>	Figure 6
Areas of geological significance and soil hazard	The subject land does not contain/support any karst, caves, crevices, cliffs, or other areas/features of geological significance. There are no hazard soil features.	-
Areas of outstanding biodiversity value	The subject land does not support or occur near any declared area of outstanding biodiversity value (AOBV).	-
Percent native vegetation cover (buffer area)	<p>A 1,500 m buffer was applied to the study area resulting in an overall buffer area of 1,324 ha. This buffer area contains only woody PCTs (i.e. woodland, dry sclerophyll forest). Accordingly, the following two categories of native vegetation were defined to identify the total are of native vegetation in the buffer.</p> <ol style="list-style-type: none"> <li>1. Woody vegetation – The areas which have a woody PCT and retain remnant woody vegetation or woody regrowth.</li> <li>2. Non-woody vegetation – The areas which have a woody PCT from which the woody vegetation has been cleared, yet at least a substantial proportionate cover (i.e. &gt; 35%) of native groundstorey species remains (often referred to as derived or secondary grassland).</li> </ol>	Figure 5



Landscape Feature	Description	Figure Reference
	<p>Native vegetation cover was first identified and mapped via interpretation of the available aerial imagery (NSW LPI and Google Satellite). The presence of remnant canopy trees, cultivation patterns in paddocks, unnaturally green and/or uniform groundstorey vegetation etc., were important factors considered during aerial interpretation. Field reconnaissance was then undertaken to ground truth and refine the mapping where possible. This field reconnaissance involved driving the publicly accessible roads within the buffer area and making observations across paddocks etc. from the roadside.</p> <ol style="list-style-type: none"> <li>1. Woody vegetation cover – 520 ha (39%) of the buffer area was determined to support native woody vegetation cover.</li> <li>2. Non-woody vegetation cover – 167 ha (13%) of the buffer area was determined to support native non-woody vegetation cover.</li> </ol> <p style="text-align: center;">↓</p> <p>Total native vegetation cover – the total area of native vegetation cover in the buffer area is 687 ha (52%). This falls into the &gt;30–70% cover class in the BAM Calculator.</p>	

Legend

- Subject Land - Stage 3
- Study Area - Lot 23 DP1256090

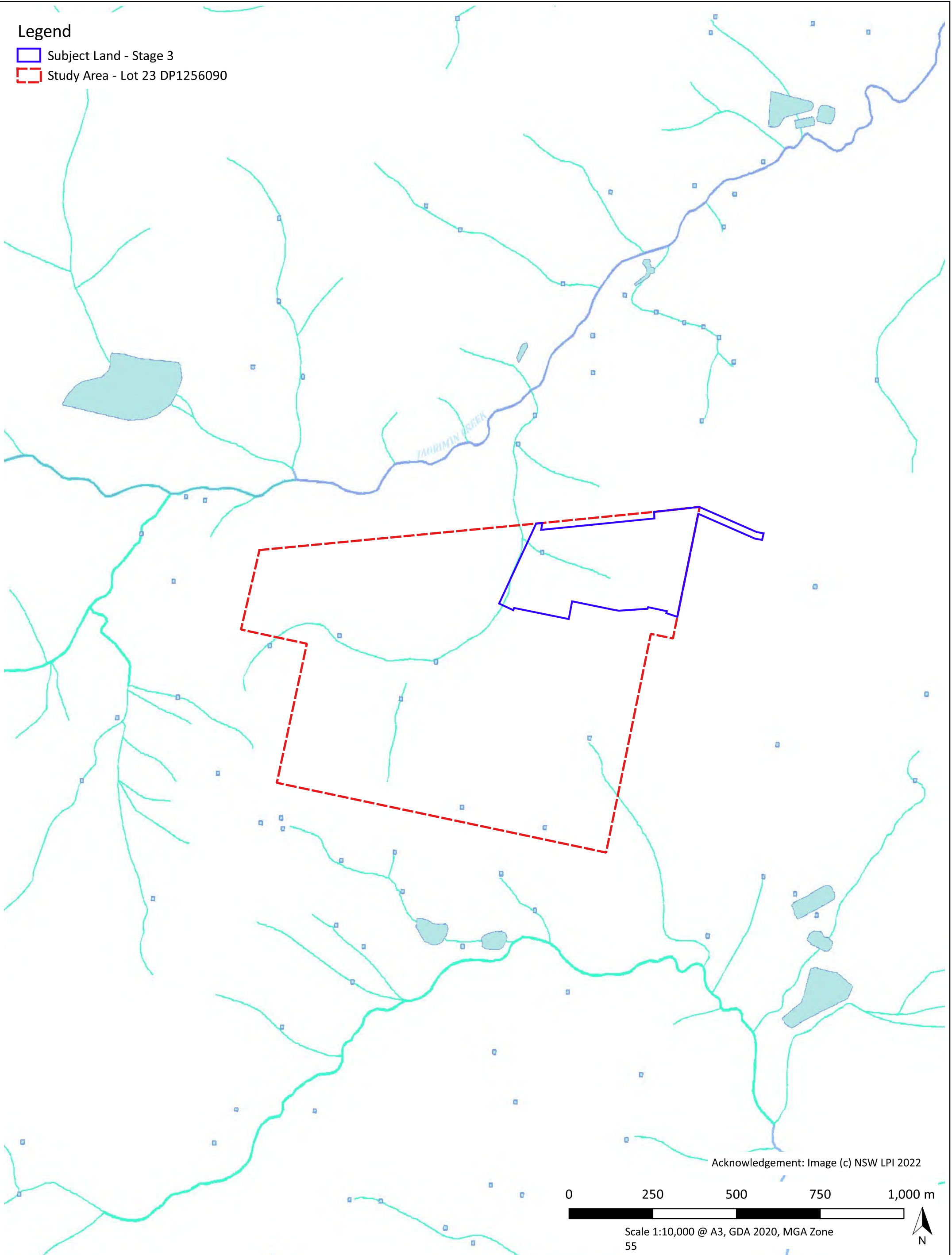
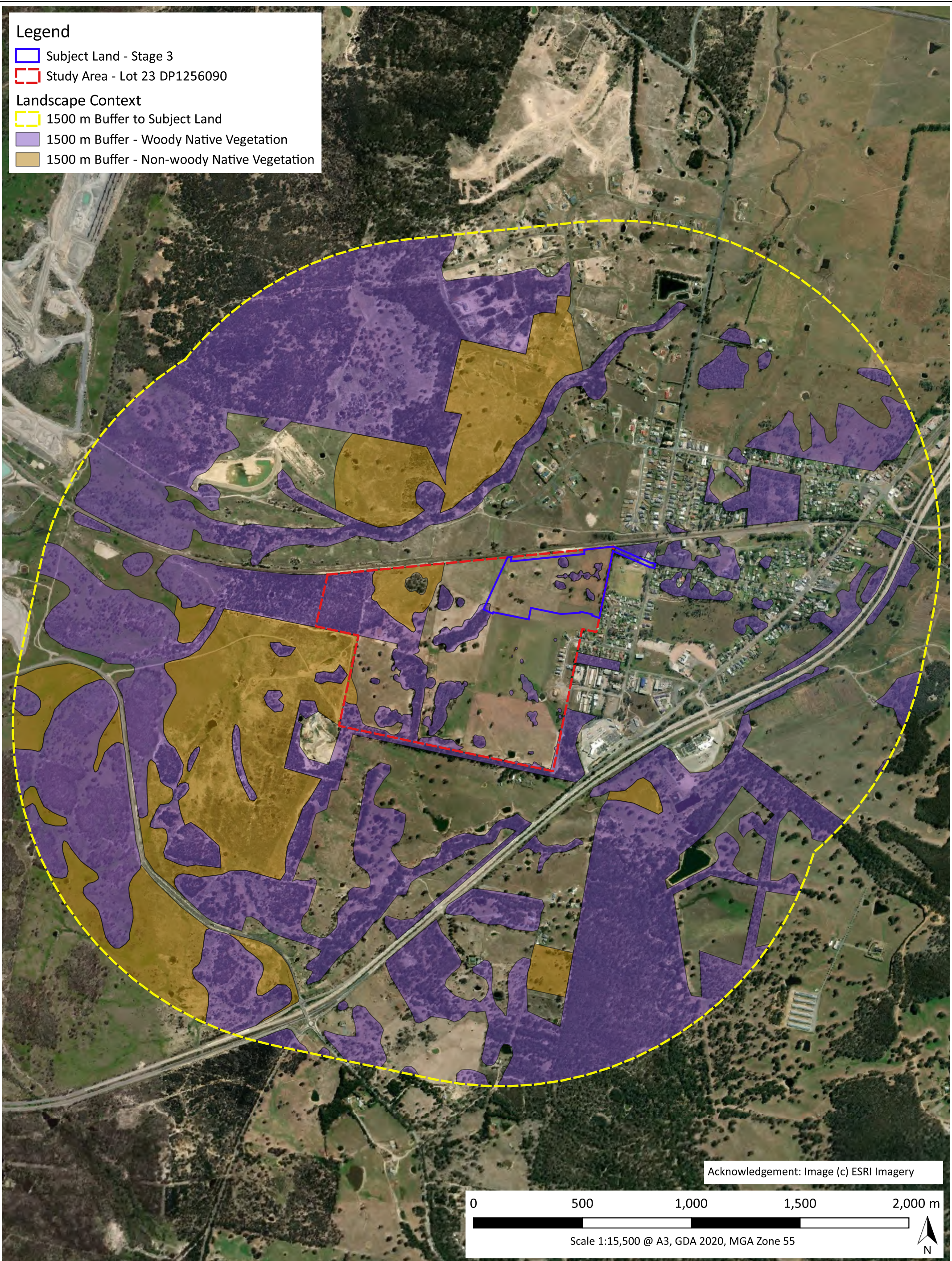


Figure 4. Hydrology

Capital Ecology Project No: 3148  
Drawn by: C. Ross  
Date: 27 June 2023

- Legend**
- Subject Land - Stage 3
  - Study Area - Lot 23 DP1256090
- Landscape Context**
- 1500 m Buffer to Subject Land
  - 1500 m Buffer - Woody Native Vegetation
  - 1500 m Buffer - Non-woody Native Vegetation



Acknowledgement: Image (c) ESRI Imagery

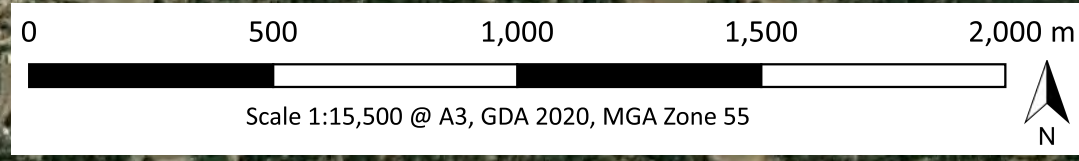


Figure 5. Site Map

Capital Ecology Project No: 3148  
 Drawn by: C. Ross  
 Date: 27 June 2023



## 2.2 Native Vegetation, Threatened Ecological Communities and Vegetation Integrity

### 2.2.1 Native vegetation extent

As per the BC Act, native vegetation is defined according to Part 5A of the *Local Land Services Act 2013* (LLS Act), which states –

*(1) For the purposes of this Part, 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.*

*(2) A plant is native to New South Wales if it was established in New South Wales before European settlement. The regulations may authorise conclusive presumptions to be made of the species of plants native to New South Wales by adopting any relevant classification in an official database of plants that is publicly accessible.*

As per this definition, planted vegetation which comprises plant species native to NSW, regardless of whether or not the species are indigenous to the specific region and/or PCT of the subject land, is classified as native vegetation.

The Commonwealth Government<sup>13,14</sup>, ACT Government<sup>15</sup>, and previous NSW Government<sup>16</sup> assessment guidelines for the temperate grassland and woodland PCTs of the NSW/ACT Southern Tablelands region each declare vegetation as native dominant if 50% or more of the perennial groundlayer is comprised of native species. However, no such threshold is defined by the BAM, and advice from the Department of Planning and the Environment (DPE) has been that the criteria for use in determining native vs. exotic dominance must be more stringent than the previously applied 50/50 rule. It is understood that this is due to the potential for seasonal variation and/or assessor disparity to substantially alter the BAM mapping result. For example, a patch of vegetation that is classified as 55% native in one season may be classified as 45% native in another.

With regard to the above, for the purposes of this BDAR (and the supporting BAM assessment):

1. 'Native vegetation' is defined as any plant, naturally occurring or planted, which is native to NSW.
2. Exotic vegetation is defined as any plant which is not native to NSW.

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<sup>13</sup> Commonwealth of Australia (2006). *Policy Statement 3.5: White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands*. Commonwealth Department of Environment and Heritage.

<sup>14</sup> Commonwealth of Australia (2016). *Approved conservation advice for the Natural Temperate Grassland of the South Eastern Highlands (NTG–SEH) ecological community*.

<sup>15</sup> ACT Government (2010). *Survey guidelines for determining lowland vegetation classification and condition in the ACT*. Environment and Sustainable Development Directorate – Conservation Planning and Research.

<sup>16</sup> NSW Government (2014). *BioBanking Assessment Methodology 2014*. NSW Government Office of Environment and Heritage.

3. A polygon of vegetation is ‘native vegetation’ if:
  - a. 35% (i.e. approximately one-third) or more of the perennial groundlayer comprises species native to NSW; and/or
  - b. species native to NSW are present in one or more of the other strata.

### 2.2.2 Vegetation survey and mapping methods

The vegetation throughout the entirety of the subject land was surveyed and mapped in accordance with the BAM. Vegetation survey dates and survey effort are detailed in Table 2. The methodology involved the following.

- Mapping of the on-ground boundaries of the Plant Community Types (PCTs).
- Stratification of each PCT into vegetation zones reflecting the broad condition state of vegetation.
- The completion of a series of surveys to measure the composition, structure, and function attributes of the vegetation.

These steps are described in more detail below. The full BAM and supplementary resources are available online via the DPE website <https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/accredited-assessors/biodiversity-assessment-method-2020>.

It is important to note that the information and data collected during vegetation survey and mapping (Section 2.2.2.1 to 2.2.2.4) were also used to assess the subject land for the presence/absence of habitat constraints and/or microhabitats for ecosystem credits species (Section 2.3.3) and species credit species (Section 2.3.4).

**Table 2. Vegetation survey dates and survey effort.**

Task	Method	Date	Personnel	Survey effort
PCT and Zone mapping review	Random meander	11/7/2022	1 person	1 hour
Vegetation assessment	BAM plot	11/7/2022	2 people	12 hours
Tree habitat assessment	Tree survey	11/7/2022	2 people	2 hours

#### 2.2.2.1 Plant Community Type (PCT) mapping

The on-ground boundaries of each of the Plant Community Types (PCTs) present in the subject land were mapped by marking boundaries directly onto high resolution orthorectified aerial photograph field maps. The PCTs and their characteristics are provided in the NSW Vegetation Information System (VIS) <https://www.environment.nsw.gov.au/research/Vegetationinformationsystem.htm>.

The PCTs were identified, and their boundaries defined, based on the:

- presence, species, growth form and density of remnant canopy trees and/or stags or stumps of these;
- presence and species of midstorey shrubs and trees;
- floristic composition of the groundstorey; and
- the landscape position and other geographical features (elevation, aspect, soils, apparent hydrology).

The recently released State Vegetation Type Map (SVTM)<sup>17</sup> is a regional-scale map of each of the three levels of the NSW vegetation classification hierarchy. It maps the distribution of each PCT, Vegetation Class, and Vegetation Formation across all tenures in NSW. These mapping products are derived from a range of data including remote sensing and existing vegetation mapping. The PCT allocation determined by Capital Ecology was compared to the SVTM map for verification.

### 2.2.2.2 Vegetation zone definition and mapping

The mapped PCTs were further divided into vegetation zones based on the structure, floristic composition and overall condition ('condition state') of the vegetation. The vegetation zones were mapped in the field and then digitised using GIS which provided accurate calculations of the total area of each vegetation zone in the subject land.

### 2.2.2.3 Survey Plots/Transects

A series of a BAM plots (i.e. vegetation assessment survey plot/transect sets) were completed to adequately sample each vegetation zone. Figure 9 from NSW Government (2020b<sup>18</sup>), each BAM Plot involved:

- a. one 20 x 20 m (400 m<sup>2</sup>) plot, used to assess the composition and structure attributes;
- b. one 20 x 50 m plot (1,000 m<sup>2</sup>) plot, used to assess the function attributes; and
- c. five 1 m<sup>2</sup> sub-plots, used to assess average little cover (and other optional groundcover components) for the plot.

All BAM plot locations were selected randomly within the vegetation zone, by marking on a map and walking to the location. As stated in Section 1.1, the 'subject land' only relates to the portions of the 'study area' area which will be impacted by the proposed development. BAM plot locations were spread throughout the entire subject land (refer to Figure 6).

The number of BAM plots completed in each vegetation zone of the subject land was determined as per the minimum required plot numbers specified in Table 3 of the BAM. As shown in Figure 6, a total of five plots were completed across three vegetation zones.

As stated in Section 4.1.2 of the BAM –

*Any part of the study area that does not contain native vegetation does not need to be assessed under this chapter, **unless** the land is:*

- a. proposed for restoration as part of a biodiversity stewardship site (see Stage 3), or*
- b. assessed as habitat for threatened species according to Chapter 5.*

*All parts of the study area that do not contain native vegetation must be clearly shown on the Site Map. Justification as to why these areas do not support **any** native vegetation must be provided in the BAR.*

With respect to this BDAR, only PCT3486 Zones 1 and 3 meet the definition of BC Act 'native vegetation'. However, PCT3486 Zone 4 supports a very small native component (Appendix A and Appendix B). Accordingly, BAM plots were also completed in Zone 4. Surveying all zones ensured

<sup>17</sup> Roff A, Day M, Thonell J and Denholm B (2022). *NSW State Vegetation Type Map: Technical Notes*. NSW Department of Planning and Environment, Parramatta, Australia.

<sup>18</sup> NSW Government (2020b). *Biodiversity Assessment Method Operational Manual – Stage 1*. State of New South Wales and Department of Planning, Industry and Environment.

that the vegetation composition (including an accurate determination of BC Act native vegetation presence/absence) and potential threatened species habitat were accurately assessed across all of the vegetation condition types present in the subject land and subject land.

#### 2.2.2.4 Tree habitat assessment

All of the mature remnant trees (i.e. >20 cm DBH) present in the subject land were assessed for the presence of functional hollows and/or large stick nests. If either a functional hollow or large stick nest were observed, the tree was identified to species level and assessed for its value to native fauna. Particular attention was given to observations on fauna nesting in the hollows or in large stick nests. The location of any tree containing a functional hollow and/or large stick nest was recorded via hand-held GPS and the following data was taken:

- tree number;
- tree species;
- diameter at breast height DBH (cm);
- approximate height (m); and
- characteristics of hollows and other habitat values such as nests, mistletoe etc.

#### 2.2.3 BAM targeted survey methods

A number of threatened flora and fauna species were identified by the BAM as potentially occurring in the subject land (referred to as ‘species credit species’). Some of these species were excluded from further consideration based on factors such as habitat constraints, degraded habitat, geographical limitations, or the absence of required microhabitat features (refer to Table 14). Survey dates and survey effort for the remaining species credit species considered to have the potential to occur in the subject land are detailed in Table 3. Weather conditions for survey dates are detailed in Table 4. In total, the survey effort for this assessment totalled 63-person hours.

Opportunistic observations of fauna and flora species in the subject land were taken during the field surveys completed for this BDAR. An inventory of all species identified in the subject land are presented in Appendix B (flora) and Appendix C (fauna). Maintaining an inventory in this manner ensures that the maximum possible diversity of species is recorded, and if present, any significant species are flagged.

**Table 3. Flora and fauna survey dates and survey effort<sup>19</sup>.**

Task	Method	Date	Personnel	Survey effort
Threatened flora survey	Transect Survey	04/12/2019	1 person	3 hours
	Opportunistic observations	-	1-4 people	23 hours
Threatened bird survey	Area search	04/12/2019	1 person	1 hour
	Fauna nesting survey	06/11/2019	2 people	12 hours
	Opportunistic observations	-	1-4 people	38 hours

<sup>19</sup> Surveys completed as part of Capital Ecology (2020). *Marulan Estates Subdivision – Stage 3 – Biodiversity Development Assessment Report*. Draft 01 – September 2020. Prepared for Darraby Pty Ltd. Authors: S. Reid, S. Thompson, and R. Speirs. Project no. 2991.

Task	Method	Date	Personnel	Survey effort
Threatened nocturnal fauna survey	Spotlighting and call playback in likely habitat	02/08/2019	4 people	12 hours
		04/12/2019	4 people	12 hours

**Table 4. Survey weather conditions (Goulburn, NSW).**

Date	Temperature Min-Max	Wind @ 9am	Cloud (8 <sup>th</sup> )	Rain
26/7/2019	-1.5 – 13.8°C	15 km/h	N/A	0 mm
2/8/2019	-3.4 – 14.9°C	Calm	0	0 mm
6/11/2019	4.0 – 23.7°C	35 km/h	0	0 mm
4/12/2019	11.2 – 23.7°C	26 km/h	8	0 mm
11/7/2022	0.4 – 12.6°C	15 km/h N	0	0.2 mm

### 2.2.3.1 Threatened flora survey

Based on the location and the ecological communities present, the study area was assessed as having the potential to support EPBC Act and/or BC Act listed threatened flora species. Some threatened flora species are identified by the BAM as a species credit species (refer to Section 2.3.4), which is a species for which presence/absence and habitat value cannot be reliably predicted by location, vegetation type, and vegetation condition. Accordingly, targeted surveys are required to determine the species credit value of the subject land for these species.

In accordance with the above, a targeted threatened flora transect survey was conducted across the portions of the subject land and wider study area identified as potentially supporting threatened flora species, these being the less disturbed portions of the study area (Figure 9). The transect survey involved one ecologist walking multiple transects across the identified areas (totalling 3 hours of effective survey effort), targeting threatened flora species. If detected, significant species identified were recorded via a GPS waypoint and, if a population, the population boundary was delineated via GPS.

A thorough inventory of the flora species occurring at a site on the NSW Southern Tablelands cannot be compiled from a small number of surveys undertaken at any particular time. For example, many groundstorey flora species, notably the orchids, lilies, and peas, are only readily identifiable during their short and seasonally variable flowering period. As such, an inventory of all species identified in the subject land was commenced during the preliminary field inspection (26 July 2019) and supplemented across all of the subsequent surveys undertaken until the final field survey (11 July 2022). This inventory is presented in Appendix B (flora). Maintaining an inventory in this manner ensures that the maximum possible diversity of species is recorded, and if present, any significant species are flagged. If detected, all significant species identified are recorded via a GPS waypoint and, if possible, the population size is counted or estimated.

### 2.2.3.2 Threatened bird survey

Based on the location and the ecological communities present, the study area was assessed as having the potential to support EPBC Act and/or BC Act listed threatened bird species. Some threatened bird species are identified by the BAM as a species credit species (refer to Section 2.3.4). Accordingly, targeted surveys are required to determine the species credit value of the subject land for these species.



Therefore, targeted threatened bird surveys were conducted across the portions of the subject land and wider study area identified as potentially supporting threatened bird habitat, these being areas with a moderate to high canopy cover (Figure 10). As described in Section 5 of DEC (2004<sup>20</sup>), these surveys involved 'area searches' (Loyn 1986<sup>21</sup>) to identify and record the terrestrial birds occurring in the study area (totalling 5.33 hours of effective survey effort). If detected, significant species identified were recorded via a GPS waypoint and notes were taken on any nesting/breeding activity.

In addition, as mentioned in Section 2.2.2.4, all of the mature remnant trees (i.e. >20 cm DBH) present in the subject land and wider study area were assessed for fauna habitat features (refer to Figure 10). At that time, these trees were also inspected for signs of fauna nesting in hollows and/or on large stick nests (e.g. individuals in hollows, scratch/chew marks, birds flying off nests, birds 'on station'). Particular attention was given to any signs of species credit species breeding in the subject land. These surveys were timed to coincide with the nesting period for the significant bird species with the potential to occur in the study area.

A thorough inventory of the bird species occurring at a site on the NSW Southern Tablelands cannot be compiled from a small number of surveys undertaken at any particular time. As such, an inventory of all species identified in the study area was commenced during the preliminary field inspection (26 July 2019) and supplemented across all of the subsequent surveys undertaken until the final field survey (11 July 2022). This inventory is presented in Appendix C (fauna). Maintaining an inventory in this manner ensures that the maximum possible diversity of species is recorded, and if present, any significant species are flagged. If detected, all significant species identified are recorded via a GPS waypoint and, if possible, the population size is counted or estimated.

### 2.2.3.3 Threatened nocturnal fauna survey

Based on the location and the ecological communities present, the subject land was assessed as having the potential to support EPBC Act and/or BC Act listed threatened nocturnal fauna species. Some threatened nocturnal fauna species are identified by the BAM as a species credit species (refer to Section 2.3.4). Accordingly, targeted surveys are required to determine the species credit value of the subject land for these species.

Therefore, a random meander search was conducted throughout the more intact vegetation in the subject land and remainder of Lot 23 DP1256090, targeting significant nocturnal fauna species.

The targeted search involved two 3-hour surveys by four ecologists (Table 3). This was considered sufficient given the small size of the subject land and study area, its history of disturbance, sparse tree cover, and small number of hollow-bearing trees. The targeted searches began 1.5 hours after sunset and involved two groups of two ecologists walking through potential habitat with Lightforce™ Enforcer 140 mm LED handheld spotlights. Potential habitat was identified during daylight hours and consisted primarily of patches of remnant vegetation. Particular attention was given to patches of remnant vegetation which included hollow bearing trees.

Squirrel Glider *Petaurus norfolcensis* call playbacks were conducted in each patch of remnant vegetation surveyed. At each call playback location spotlights were turned off and a variety of Squirrel Glider calls were played (sourced from <https://wildambience.com/wildlife-sounds/squirrel->

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<sup>20</sup> DEC (2004). *Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft)*. New South Wales Department of Environment and Conservation, Hurstville, NSW.

<sup>21</sup> Loyn, R.H. (1986). 'Birds in fragmented forests in Gippsland, Victoria'. In Keast, A., Recher, H.F., Ford, H. and Saunders, D. (eds.). In *Birds of Eucalypt Forests and Woodlands; Ecology, Conservation Management*, RAOU; and Surrey Beatty and Sons.

glider/). One minute of listening time followed each call playback. Any fauna calls were noted, and an associated GPS location was taken. An inventory of all nocturnal fauna species identified in the subject land and study area are included in Appendix D (fauna).

## 2.2.4 Vegetation survey and mapping results

### 2.2.4.1 Plant Community Type (PCT) mapping

The subject land has been substantially modified by its current and past land use, which has primarily been grazing (sheep, cattle, horses, and pigs) and some cropping. This has led to extensive clearing of the native woody overstorey, midstorey, and shrubstorey across approximately 89% of the study area. The majority of this cleared land has been cultivated and was sown to cereal crops or pasture. The patches of vegetation in the subject land that have retained a woody overstorey have still been substantially modified by historic agricultural activities and in general lack a midstorey, shrubstorey, and native groundstorey.

This high degree of modification makes accurate identification of the PCT difficult. Of the trees which remain (estimated to be 11% of those which occurred before European settlement), the dominant overstorey species are Thin-leaved Stringybark *E. eugenioides* and Cabbage Gum *E. amplifolia*, with Blue-leaved Stringybark *E. agglomerata* and Yellow Box *E. melliodora* occurring as sub-dominant or associate species in the crown road reserve which comprises the eastern in extent of the subject land. There are also a small number of Candlebark *E. rubida*, Apple Box *E. bridgesiana*, and Argyle Apple *E. cinerea* scattered across the study area. As a result, the initial PCT allocated to the subject land was PCT778 *Coast Grey Box - stringybark dry woodland on slopes of the Shoalhaven Gorges, southern Sydney Basin Bioregion*.

Based on feedback for previous projects in the study area, the PCT allocation was reconsidered for this BDAR. This process was undertaken by interrogating the NSW Vegetation Information System PCT data power query excel spreadsheet using the following filters:

- IBRA – contains ‘South Eastern Highlands’;
- IBRA Subregion – contains ‘Bungonia’; and
- Vegetation Formation – contains ‘Grassy Woodlands’ or ‘Dry Sclerophyll Forests (Shrub/grass sub-formation)’.

This process resulted in 37 candidate PCTs and an additional 38 decommissioned PCTs (including PCT778). Of those candidate PCTs, PCT3486 contains the most appropriate upper stratum species in both ‘median cover score’ and ‘frequency’ as listed in the NSW VIS.

The NSW VIS describes PCT3486 as –

*...primarily from Wombeyan Caves south to Bungonia and Jockeys Point, on soils derived from Abercrombie Formation sediments and from Barrallier Ignimbrite, at elevations of 400-850 metres asl and with mean annual rainfall of 650-850 mm. The tree stratum commonly includes Eucalyptus macrorhyncha, with occasional Eucalyptus bridgesiana or rarely Eucalyptus cinerea, Eucalyptus melliodora or Eucalyptus eugenioides. Shrubs are sparse to patchy and commonly include Lissanthe strigosa, Olearia viscidula, Bursaria spinosa, Hibbertia obtusifolia, and occasional scattered tall Acacia falciformis. The ground layer is often grassy, almost always including Microlaena stipoides, very frequently with Echinopogon ovatus, and commonly including Poa sieberiana, Austrostipa rudis and Elymus scaber. Forbs include very frequent tall clumps of Lomandra longifolia and a diverse suite of small forbs that commonly includes*

Hydrocotyle laxiflora, Lomandra filiformis, Cheilanthes sieberi subsp. sieberi, Hypericum gramineum, Veronica plebeia, Dichondra repens, Geranium solanderi, Plantago debilis, Desmodium varians, Gonocarpus tetragynus, Goodenia hederacea and Oxalis perennans. *This community may be replaced by PCT 3483 on lower, warmer gorge slopes, or by PCT 3643 on exposed, rocky upper slopes and crests with shallow to skeletal soils.*

The newly released SVTM has mapped five PCTs as occurring in the study area. While ‘PCT3376 - Southern Tableland Grassy Box Woodland’ is mapped across most the study area in the SVTM, PCT3486 is mapped in adjacent areas and is considered more appropriate when considering landscape position, vegetation formation, and species composition, particularly in the more intact vegetation found in the crown road reserve (PCT3486 Zone 1).

In light of the above, it is concluded that before European occupation the subject land and wider study area are likely to have been characterised by a single grassy open forest PCT (i.e. PCT3486, see Table 5 and Figure 6).

**Table 5. PCTs recorded in the subject land**

PCT	PCT name	PCT description	Occurrence in subject land	TEC status Commonwealth / NSW	PCT % cleared
3486	Wollondilly-Shoalhaven Slopes Grassy Open Forest	A tall dry grass/shrub sclerophyll open forest of upper slopes of the gorges of the mid Shoalhaven and mid Wollondilly River (and tributaries).	This PCT was mapped across the entire subject land.	This PCT has no associated TEC	60%

As mentioned previously, the majority subject land has been substantially cleared and modified by its current and past land use, which has primarily been grazing (sheep, cattle, horses, and pigs) and some cropping. This has led to extensive clearing of the native woody overstorey, midstorey, and shrubstorey across approximately 89% of the subject land. This cleared land has been cultivated and sown to cereal crops or pasture. The patches in the subject land with a retained woody overstorey have still been substantially modified by historic clearing and agricultural activities and lack a midstorey, shrubstorey, and native groundstorey.

In addition to the above, the portion of the subject land located in the Goulburn Street road reserve supports the grassy open forest community in relatively intact form, with a canopy of Apple Box, Thin-leaved Stringybark, and Argyle Apple, with scattered Yellow Box, Cabbage Gum, and Black She-oak. Some scattered shrubs and regeneration of the canopy. Whilst this area is still moderately disturbed and contains some common weeds, the groundlayer is dominated by perennial native grasses (particularly Kangaroo Grass and Rough Speargrass) with a moderate to high diversity of forbs.

#### 2.2.4.2 Vegetation zones

As outlined above, the study area contains one PCT (3486). This PCT was classified into four zones, of which only three occur within the subject land (Table 6, Figure 6). A total of five BAM plots were surveyed across the three vegetation zones. The locations of the plots are shown in Figure 6, and the results presented in Appendix A and B. The characteristics of the vegetation zones are summarised in Table 6 to Table 9. Given the narrow road reserved for Goulburn Street, the BAM Plot for PCT3486

Zone 1 occurs partially outside of the subject land. The vegetation assessed is representative of the vegetation that will be impacted by the proposed development and is considered acceptable in assessing the impacts.

**Table 6. PCT3486 Vegetation zone details**

	PCT3486		
	Zone 1	Zone 3	Zone 4
Native Canopy	Yes	Yes	No
Regeneration of the overstorey	Yes	No	No
Groundstorey	Native	Exotic	Exotic
Native Diversity	Moderate	Low	Low
Area in the study area	0.21 ha	1.31 ha	12.38 ha
BAM plots assessed in the study area	1	1	3
BC Act Native Vegetation	<b>Yes</b>	<b>Yes</b>	No
BC Act TEC	No	No	No
EPBC Act TEC	No	No	No

(Note: the zone numbering has been carried over from the previous assessments. As such, Zone 2 does not occur in the subject land and has not been included in this BDAR).

PCT3486 Zones 1 and 3 meet the definition of BC Act ‘native vegetation’ (Figure 7). PCT3486 Zone 4 does not meet the definition of BC Act ‘native vegetation’ as it has a groundstorey clearly dominated by exotic grasses and forbs (i.e. >65% perennial exotic) and does not contain a cover of native trees and/or shrubs. However, as PCT3486 Zone 4 does support a very small native component (Appendix A and Appendix B) it must be assessed to determine the impact of the proposed development.

#### 2.2.4.3 Hollow bearing remnant trees

The study area supports six hollow bearing remnant trees, all of which occur in PCT3486 Zone 3 (Figure 6, Appendix C). Five of these trees contain hollows with entrance diameters < 5 cm, and one tree contains a single hollow with an entrance diameter of 5 – 20 cm. No trees contain a hollow with an entrance diameter > 20 cm.

The subject land itself does not support any hollow bearing remnant trees. As such, no hollow bearing trees will be impacted by the proposed development.

**Table 7. PCT3486 Zone 1 results summary.**

PCT3486 Zone 1	
Description	<p><u>Wollondilly-Shoalhaven Slopes Grassy Open Forest Southern Tableland Grassy Woodland – Moderate to High Diversity</u></p> <p>Relatively intact vegetation, with a canopy of Apple Box, Thin-leaved Stringybark, and Argyle Apple, with scattered Yellow Box, Cabbage Gum, and Black She-oak. Some scattered shrubs and regeneration of the canopy.</p> <p>This zone is moderately disturbed and contains a moderate cover and diversity of common weeds. The groundlayer has retained a predominantly native cover that is dominated by perennial native grasses (particularly Kangaroo Grass and Rough Speargrass) with a moderate to high diversity of forbs.</p> <p>This zone is restricted to the road reserve for the proposed extension of Goulburn Street. For the purpose of this BDAR, it is assumed that the entirety of this zone will be directly impacted by the proposed development.</p>
Area – subject land	0.21 ha.
BAM plots assessed	1.
Overstorey Species	<p>Dominant = <i>E. bridgesiana</i>, <i>E. eugenioides</i>, and <i>E. eugenioides</i>.</p> <p>Associate = <i>E. melliodora</i>, <i>E. cinerea</i>, and <i>Allocasuarina littoralis</i></p>
Overstorey Cover	43%.
Overstorey Regeneration	Yes.
Perennial Groundlayer	59% native, with 10 native non-grass understorey species.
Significant Weeds	Panic Veldtgrass <i>Ehrharta erecta</i> , African Lovegrass <i>Eragrostis curvula</i> , and Blackberry <i>Rubus fruticosus</i> .
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	Yes.



**Table 8. PCT3486 Zone 3 results summary.**

PCT3486 Zone 3	
Description	<p><u>Wollondilly-Shoalhaven Slopes Grassy Open Forest – Exotic Groundstorey</u></p> <p>This zone is characterised by a thinned canopy dominated by Thin-leaved Stringybark occurring in isolated patches. There is no regeneration of the canopy and many of these trees have been damaged by stock overtime. The midstorey and shrubstorey are entirely absent.</p> <p>The groundlayer supports very low diversity and is dominated by a variety of exotic grasses and forbs. There is a moderate density of significant weed species.</p> <p>Moderately grazed by cattle and Eastern Grey Kangaroos.</p>
Area – subject land	1.31 ha.
BAM plots assessed	1.
Overstorey Species	Dominant = <i>E. eugenioides</i> .
Overstorey Cover	10%.
Overstorey Regeneration	No.
Perennial Groundlayer	2% native, with 1 native non-grass understorey species.
Significant Weeds	Serrated Tussock <i>Nassella trichotoma</i> , Blackberry, and Sheep’s Sorrel <i>Rumex acetosella</i> .
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	Yes.



**Table 9. PCT3486 Zone 4 results summary.**

PCT3486 Zone 4	
Description	<p><u>Low Diversity Exotic Pasture</u></p> <p>The overstorey, midstorey, and shrubstorey are entirely absent. The groundlayer is highly disturbed with evidence of historic cultivation and pasture improvement, and is now dominated by exotic perennial and annual grasses and forbs. Low density of significant weed species, specifically Fireweed <i>Senecio madagascariensis</i>, and Prickly Pear <i>Opuntia sp.</i>.</p> <p>Moderately grazed by stock and Eastern Grey Kangaroo.</p>
Area – subject land	12.38 ha.
BAM plots assessed	3.
Overstorey Species	None.
Overstorey Cover	0%.
Overstorey Regeneration	No.
Perennial Groundlayer	0% - 1% native, with 0 - 1 native non-grass understorey species.
Significant Weeds	Fireweed <i>Senecio madagascariensis</i> , Prickly Pear <i>Opuntia sp.</i> , African Lovegrass, Serrated Tussock, Blackberry, Tall Flat-sedge, and Sheep’s Sorrel.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	No.



#### 2.2.4.4 Patch size

As defined in the BAM, patch size is –

*an area of native vegetation that:*

- a) occurs on the development site or biodiversity stewardship site, and*
- b) includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or  $\leq 30\text{m}$  for non-woody ecosystems).*

*Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site.*

With respect to the above, the areas mapped as PCT3486 Zone 1 and Zone 3 meet the definition of ‘native vegetation’ as per the BAM (refer to Figure 6 and Figure 7). The native vegetation outside of the subject land extends to the south and west (Figure 5) (i.e. scattered remnant paddock trees and woodland/forest patches). When native vegetation from adjoining land is considered, the patch size for both PCT3486 Zone 1 and Zone 3 falls within the  $>100$  ha class as defined by the BAM.

As detailed below, the remaining vegetation zone (PCT3486 Zone 4) does not meet the definition of native vegetation as it lacks some or all of the structural growth form groups expected of the PCT. The patch size for PCT3486 Zone 4 is therefore 0 ha.

#### 2.2.4.5 Vegetation integrity scores

Zones which support any amount of ‘native vegetation’, regardless of how small, and which occur in the development footprint are used to determine vegetation integrity scores and the impacts associated with the proposed development. Zones which do not support **any** native vegetation do not require further assessment in the BAM except where:

- (a) they are proposed for restoration as part of a biodiversity stewardship site; or
- (b) they are assessed as habitat for threatened species.

As detailed in Table 7 to Table 9 and shown in Figure 7, PCT3486 Zone 1 and Zone 3 meet the definition of BC Act ‘native vegetation’. PCT3486 Zone 4 does not meet the definition of BC Act ‘native vegetation’ as it has a groundstorey clearly dominated by exotic grasses and forbs (i.e.  $> 65\%$  perennial exotic) and does not contain a cover of native trees and/or shrubs. However, as PCT3486 Zone 4 does support a very small native component (Appendix A and Appendix B) it must be assessed to determine the impact of the proposed development.

Table 10 presents the results of the BAM plot assessments and details the composition, structure, function, and resulting vegetation integrity score for each zone.



**Table 10. Vegetation integrity scores.**

	PCT3486		
	Zone 1	Zone 3	Zone 4
Description	Canopy Native groundstorey Low diversity	Canopy Exotic groundstorey Low diversity	No Canopy Exotic groundstorey Low diversity
Patch size	>100 ha	>100 ha	0
Area – subject land	0.21 ha	1.31 ha	12.38 ha
BAM plots – subject land	1	1	3
Composition condition score	35.5	1.5	0.1
Structure condition score	65.2	5.0	0
Function condition score	30.1	12.4	0
<b>Current vegetation integrity score</b>	<b>41.2</b>	<b>4.5</b>	<b>0</b>

**Legend**

- Subject Land - Stage 3

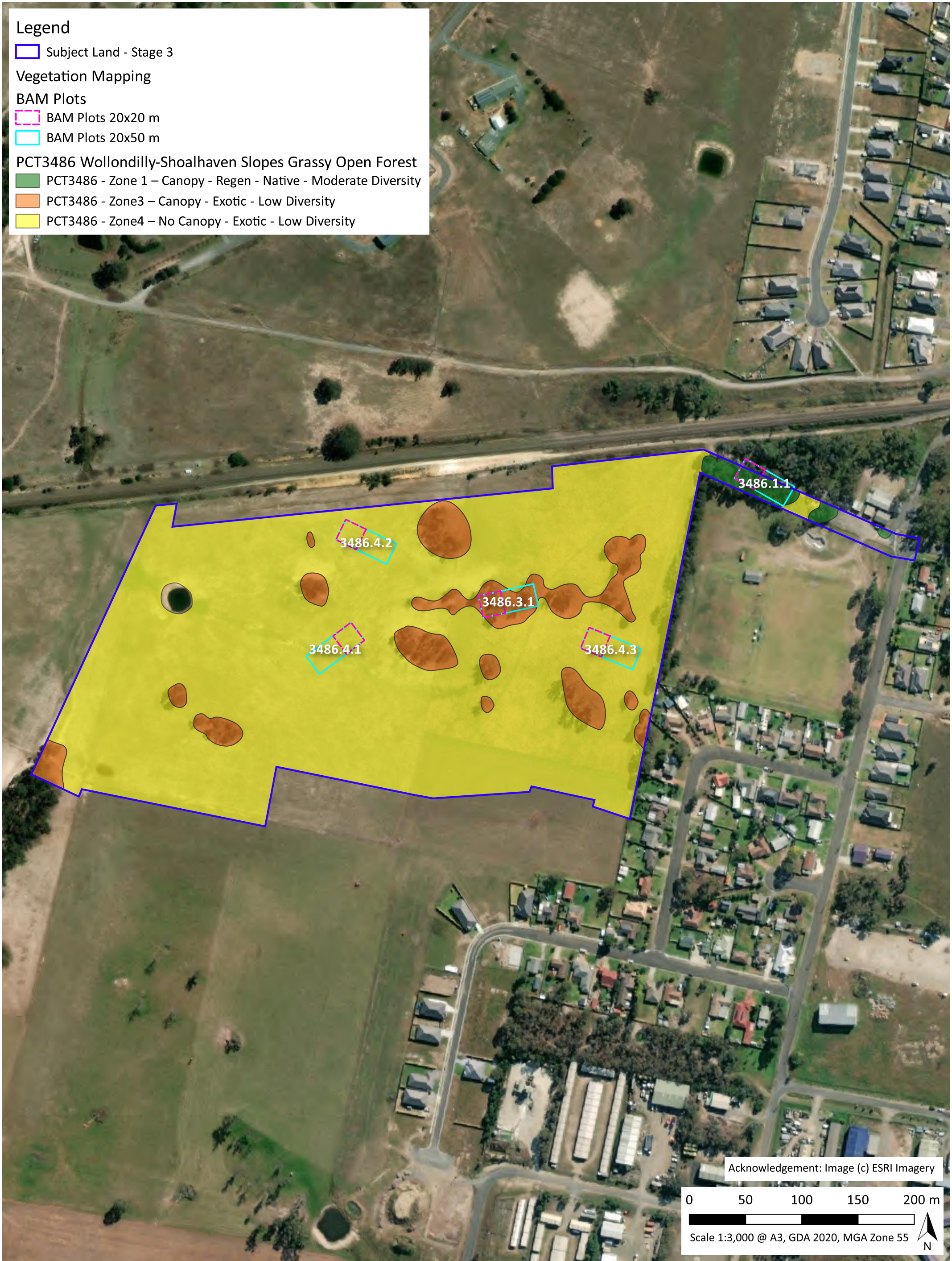
**Vegetation Mapping**

**BAM Plots**

- BAM Plots 20x20 m
- BAM Plots 20x50 m

**PCT3486 Wollondilly-Shoalhaven Slopes Grassy Open Forest**

- PCT3486 - Zone 1 – Canopy - Regen - Native - Moderate Diversity
- PCT3486 - Zone3 – Canopy - Exotic - Low Diversity
- PCT3486 - Zone4 – No Canopy - Exotic - Low Diversity



Acknowledgement: Image (c) ESRI Imagery

0 50 100 150 200 m

Scale 1:3,000 @ A3, GDA 2020, MGA Zone 55



Figure 3. Proposed Development Impact Area on Aerial Imagery



Figure 7. BC Act Native Vegetation

Capital Ecology Project No: 3148  
 Drawn by: C. Ross  
 Date: 27 June 2023

## 2.2.5 Threatened Ecological Communities

### 2.2.5.1 Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)

The following three EPBC Act listed threatened ecological communities have the potential to occur in the locality: Natural Temperate Grassland of the South Eastern Highlands (Natural Temperate Grassland); White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act Box-Gum Woodland); and Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion.

#### **Natural Temperate Grassland of the South Eastern Highlands – listed as critically endangered pursuant to the EPBC Act**

Description – As detailed in Commonwealth of Australia (2016), the Natural Temperate Grassland threatened ecological community is characterised by grassy vegetation dominated by moderately tall (25–50cm) to tall (50–100cm), dense to open tussock grasses in the genera *Rytidosperma*, *Austrostipa*, *Bothriochloa*, *Poa* and *Themeda*. Up to 70% of all plant species may be forbs. The community may be treeless or contain up to 10% cover of trees, shrubs or sedges. Natural Temperate Grassland occurs within the biogeographical region of the Sydney Basin in valleys influenced by cold air drainage and in broad plains.

Presence in the subject land – Absent – No part of the subject land supports, or historically supported, a grassland ecological community. As such, the subject land does not support this TEC.

#### **White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland – listed as critically endangered pursuant to the EPBC Act**

Description – The White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland TEC is characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs (where shrub cover comprises less than 30% cover), and a dominance or prior dominance of White Box and/or Yellow Box and/or Blakely's Red Gum trees. This TEC occurs along the western slopes and tablelands of the Great Dividing Range from southern Queensland through New South Wales and the Australian Capital Territory to Victoria.

To determine whether a patch meets the criteria for the community, the vegetation must be assessed against the flowchart provided in Policy Statement 3.5: White Box – Yellow Box – Blakely's Red Gum grassy woodlands and derived native grasslands (Commonwealth of Australia 2006). An assessment of the vegetation in the study area against this flowchart is provided below.

1. *Criterion 1. Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum?*

No – While Yellow Box occurs within the study area as an associate species, it is not considered that Yellow Box (or White Box, or Blakely's Red Gum) was previously a dominant overstorey species. None of the other listed overstorey species were recorded in the study area or are likely to have ever occurred there.

2. *Does the patch have a predominantly native understorey?*

N/A – refer Criterion 1.

3. *Is the patch 0.1 ha (1000 m<sup>2</sup>) or greater in size with 12 or more native understorey species present (excluding grasses)? There must be at least one important species.*

Or

*Is the patch 2 ha or greater in size with an average of 20 or more mature trees per hectare, or is there natural regeneration of the dominant overstorey eucalypts?*

N/A – refer Criterion 1.

Presence in the study area – Absent – No part of the study area supports, or is estimated to have historically supported, woodland with White Box, Yellow Box or Blakely's Red Gum as one of the most common species. As such, the study area does not support this TEC.

### **Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion – listed as endangered pursuant to the EPBC Act**

Description – The below description is extracted from the Commonwealth Listing Advice on Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (Threatened Species Scientific Committee 2011<sup>22</sup>).

*The Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion is typically tall open eucalypt forests found on basalt and basalt-like substrates in, or adjacent to, the Sydney Basin Bioregion. The ecological community usually occurs at elevations between 650 m and 1050 m above sea level, although outliers may occur at elevations as low as 350 m (e.g. closer to the coast) or as high as 1200 m (e.g. on higher plateaux). The ecological community occurs in areas of high rainfall, generally ranging from 1000 to 1800 mm/year.*

To determine whether a patch meets the criteria for the community, the vegetation must meet the condition thresholds outlined in the Commonwealth listing advice. An assessment of the vegetation in the subject land regarding the condition thresholds is provided below.

- *A minimum patch size at least 0.5 ha; and*
- *A total foliage cover of native trees greater than 50% in the patch (not including saplings and smaller regenerating trees to 5 m in height); and*
- *At least 20 native species are present in the understorey (mid and ground layers) of the patch; and*
- *Non-native perennial weeds account for no more than 40% of the foliage cover of the understorey (mid and ground layers) in the patch.*

Presence in the subject land – Absent – As per the EPBC Act approved conservation advice, two NSW- ecological communities have the potential to meet the criteria of this TEC. These ecological communities are 'Robertson Basalt Tall Open Forest in the Sydney Basin Bioregion' and 'Mt Gibraltar Forest in the Sydney Basin Bioregion'. None of the dominant canopy species of these two ecological communities occur in the subject land. As such, the subject land does not support this TEC.

### **Conclusion**

The subject land does not support any of the EPBC Act listed threatened ecological communities with the potential to occur in the locality.

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<sup>22</sup> Threatened Species Scientific Committee (TSSC) (2011). *Commonwealth Listing Advice on Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion*. Department of Sustainability, Environment, Water, Population and Communities.

### 2.2.5.2 Biodiversity Conservation Act 2016 (NSW)

Three BC Act listed ecological communities have the potential to occur in the study area:

- White Box – Yellow Box – Blakely's Red Gum Woodland' (BC Act Box-Gum Woodland);
- Monaro Tableland Cool Temperate Grassy Woodland in the South East Highlands Bioregion; and
- Robertson Basalt Tall Open-forest in the Sydney Basin Bioregion.

#### **BC Act Box-Gum Woodland**

This community, listed as critically endangered in NSW, is described below, together with an assessment of its presence and condition in the subject land and wider subject land.

The below description is extracted from the NSW *Final Determination for the TSC Act endangered listed ecological community White Box – Yellow Box – Blakely's Red Gum Woodland* (NSW Scientific Committee 2002, gazetted 15 March 2002<sup>23</sup>).

*White Box Yellow Box Blakely's Red Gum Woodland is found on relatively fertile soils on the tablelands and western slopes of NSW and generally occurs between the 400 and 800 mm isohyets extending from the western slopes, at an altitude of c. 170m to c. 1200 m, on the northern tablelands (Beadle 1981). The community occurs within the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands and NSW South Western Slopes Bioregions.*

*White Box Yellow Box Blakely's Red Gum Woodland includes those woodlands where the characteristic tree species include one or more of the following species in varying proportions and combinations - Eucalyptus albens (White Box), Eucalyptus melliodora (Yellow Box) or Eucalyptus blakelyi (Blakely's Red Gum). Grass and herbaceous species generally characterise the ground layer. In some locations, the tree overstorey may be absent as a result of past clearing or thinning and at these locations only an understorey may be present. Shrubs are generally sparse or absent, though they may be locally common.*

Although the final determination does not provide specific listing criteria against which to assess a patch of vegetation, a useful key is provided in *Identification Guidelines for Endangered Ecological Communities – White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)* (NPWS 2002<sup>24</sup>), which draws its information from the final determination. As described in the final determination and the associated key, the definition for the BC Act Box-Gum Woodland TEC is extremely broad. In effect, any land for which the climax community is Box-Gum Woodland that has not been cultivated, become a stock camp, or otherwise been entirely modified, is likely to meet the minimum definition of the BC Act listed TEC.

Presence in the subject land – Absent - While Yellow Box occurs as an associate species in the study area and the surrounding properties, given the species composition of the remnant trees, it is estimated that no part of the study area would have historically supported, woodland with White

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<sup>23</sup> NSW Scientific Committee (2002). *Final Determination for the TSC Act endangered listed ecological community White Box – Yellow Box – Blakely's Red Gum Woodland*. Gazetted 15 March 2002.

<sup>24</sup> NSW Government (2002). *Identification Guidelines for Endangered Ecological Communities - White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)*. NSW National Parks and Wildlife Service.

Box, Yellow Box or Blakely's Red Gum as one of the most common species. As such, the study area does not support this TEC. This is consistent with PCT3486 not being associated with a TEC.

### **BC Act Monaro Tableland Cool Temperate Grassy Woodland in the South East Highlands Bioregion**

The Monaro Tableland Cool Temperate Grassy Woodland (CTGW) in the South East Highlands Bioregion community, listed as critically endangered in NSW, is described below, together with an assessment of its presence and condition within the subject land.

The below description is extracted from the NSW *Final Determination for the TSC Act critically endangered listed ecological community Monaro Tableland Cool Temperate Grassy Woodland in the South East Highlands Bioregion* (NSW Threatened Species Scientific Committee 2019<sup>25</sup>).

*Monaro Tableland Cool Temperate Grassy Woodland ranges in structure from woodland to low open woodland. It is characterised by a sparse to very sparse tree stratum dominated by Eucalyptus pauciflora either in monospecific stands or with any of Acacia melanoxylon, E. rubida subsp. rubida, E. stellulata or E. viminalis as codominants. A number of other tree species have been recorded within the community, although very infrequently and always as canopy subdominants. These include E. bridgesiana, E. dives, E. blakelyi and E. melliodora. Tree height and cover vary as a function of moisture availability, drainage and past land management. The tree stratum becomes shorter and sparser with declining moisture availability or increasing levels of soil waterlogging... Trees may be absent as a consequence of tree removal under pastoral management and grazing by domestic stock. A continuous herbaceous ground stratum is usually present, although this is highly variable in composition and cover as a function of grazing pressure from wild herbivores (native and exotic) and domestic stock. Ground cover species include Themeda triandra, Poa sieberiana, Elymus scaber, Hydrocotyle laxiflora, Scleranthus biflorus, Oxalis perennans, Plantago varia, Euchiton japonicus, Poa labillardieri, Hypericum gramineum, Desmodium varians, Geranium solanderi, Acaena echinata, Gonocarpus tetragynus, Microlaena stipoides, Dichondra repens, Solenogyne gunnii, Asperula conferta, Asperula scoparia, Rumex brownii, Rytidosperma laeve, Rytidosperma pilosum, Chrysocephalum apiculatum and Chrysocephalum semipapposum. The Community may develop a shrub or bracken layer as a consequence of the opening up of the ground stratum following excessive grazing by rabbits and sheep. This may include species such as Pimelea pauciflora, Acacia dealbata, Acacia melanoxylon, Acacia rubida subsp. rubida, Cassinia longifolia and Pteridium esculentum (Costin 1954).*

As stated in Part 4 of the Final Determination, the occurrence or historical occurrence of Snow Gum *Eucalyptus pauciflora* is the primary characteristic for determining the presence of the community. The final determination provides a Monaro & Werriwa CTGW Assessment Spreadsheet Tool to be used in conjunction with an Advisory Layer indicating potential extent. Presence of Snow Gum, characteristic species, non-characteristic species, stumps, and the proximity to nearest Snow Gum, are entered into the assessment tool to determine the likelihood of occurrence of the community. Part 1 of the Final Determination provides a list of an assemblage of species characteristic of the Monaro Tableland CTGW.

Presence in the subject land – Absent – The dominant tree species in the subject land are not characteristic of the dominant or co-dominant species of the BC Act Monaro Tableland Cool

<sup>25</sup> NSW Threatened Species Scientific Committee (2019). *Final Determination: Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion*. Department of Planning, Industry and Environment, Sydney. Gazetted 28 June 2019.

Temperate Grassy Woodland in the South East Highlands Bioregion TEC. As such, the subject land does not support vegetation which meets the criteria for this community under the BC Act.

### Robertson Basalt Tall Open-forest in the Sydney Basin Bioregion

Description – This community, listed as critically endangered in NSW, is described below, together with an assessment of its presence and condition in the subject land.

The below description is extracted from the Robertson Basalt Tall Open Forest in the Sydney Basin Bioregion (NSW Office of Environment, Climate Change and Water 2010<sup>26</sup>).

*The Robertson Basalt Forest is an open forest or woodland up to 30 m tall with a sparse to moderately dense shrub layer and a dense ground layer dominated by herbs. It occurs on high-fertility basalt-derived soils in areas of relatively high rainfall (about 1000–600 mm annually). The most common canopy tree species are brown barrel (Eucalyptus fastigata), ribbon gum (E. viminalis), narrow-leaved peppermint (E. radiata subsp. radiata) and river peppermint (E. elata). Blackwood (Acacia melanoxylon) is a common small tree species and shrubs that often occur include prickly currant bush (Coprosmia quadrifida) and the native daisy Senecio linearifolius.*

Presence in the subject land – Absent – The dominant tree species in the subject land are not characteristic of the BC Act definition for Robertson Basalt Tall Open-forest TEC. As such, the subject land does not support vegetation which meets the criteria for this community under the BC Act.

### 2.2.6 High threat weeds

Table 11 lists the high threat weeds (as per the BAM High Threat Weeds list) that occur in the subject land.

**Table 11. High threat weeds.**

Species Name	Common Name	Status
<b>Cactus</b>		
<i>Opuntia sp.</i>	Prickly Pear	WoNS, C, LM
<b>Shrubs</b>		
<i>Rubus fruticosus</i>	Blackberry	WoNS, LM
<i>Rosa rubiginosa</i>	Briar Rose	-
<b>Forbs</b>		
<i>Carthamus lanatus</i>	Saffron Thistle	-
<i>Hypericum perforatum</i>	St John's Wort	LM
<i>Rumex acetosella</i>	Sheep's Sorrel	-
<i>Senecio madagascariensis</i>	Fireweed	WoNS, C, LM
<b>Sedges</b>		
<i>Cyperus eragrostis</i>	Tall Flat-sedge	-
<b>Grasses</b>		
<i>Eragrostis curvula</i>	African Lovegrass	AP, LM
<i>Ehrharta erecta</i>	Panic Veldtgrass	WoNS, C, LM

<sup>26</sup> NSW Office of Environment, Climate Change and Water (2010). *Robertson Basalt Tall Open Forest in the Sydney Basin Bioregion*.



Species Name	Common Name	Status
<i>Nassella trichotoma</i>	Serrated Tussock	WoNS, C, LM

**Table key.** Commonwealth Weed of National Significance = **WoNS**. Regional Priority Weed in the South East Local Land Services region under the NSW *Biosecurity Act 2015*: **P** = Prevention; **E** = Eradication; **C** = Containment; **AP** = Asset Protection; **LM** = Species subject to Local Management programs.

## 2.3 Habitat Suitability for Threatened Species

### 2.3.1 Fauna habitat

The habitat features in the subject land were identified during the field surveys and assessed regarding their potential value to native fauna species, both threatened and common. The fauna habitat features of the subject land are described in Table 12. It is important to note that the information presented in Table 12 is also used to assess the presence/absence of habitat constraints and/or microhabitats for ecosystem credits species (Section 2.3.3) and species credit species (Section 2.3.4).

**Table 12. Fauna habitat features.**

Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Remnant eucalypts	<p>Historic clearing has removed approx. 89% of the native overstorey across the subject land. None of the remaining remnant trees in the subject land contain functional hollows or large stick nests.</p> <p>The wider study area supports six hollow bearing remnant trees (Figure 6, Appendix C). Five of these trees contain hollows with entrance diameters &lt; 5 cm, and one tree contains a single hollow with an entrance diameter of 5 – 20 cm.</p>	<p>All live remnant trees are likely to provide a foraging resource for a variety of birds and marsupials when in flower, potentially including threatened species.</p> <p>The remnant trees in the subject land are unlikely to be of value to hollow dependant fauna given the lack of functional hollows.</p>
Other native vegetation (i.e. native grasses and forbs)	<p>The narrow band of vegetation in PCT3486 Zone 1 is relatively intact, and supports a native midstorey, shrubstorey, and groundstorey with moderate diversity.</p> <p>The midstorey and shrubstorey are entirely absent throughout the remainder of the subject land.</p>	<p>The narrow band of intact vegetation in PCT3486 Zone 1 may provide a foraging resource to a variety of native birds, reptiles, and herbivorous mammals.</p> <p>The absent midstorey and shrubstorey are likely to limit the habitat value of the subject land for some of the region’s threatened woodland birds and marsupials, which generally prefer to inhabit vegetation where such features are more intact.</p>
Exotic pasture	<p>PCT3486 Zones 3 and 4 support a highly modified pasture groundstorey dominated by exotic grasses and forbs.</p>	<p>The exotic dominant pasture would provide a limited grazing resources for common birds, reptiles, and herbivorous mammals.</p> <p>Open areas are likely to provide a hunting resource for raptors and other predatory birds.</p>
Creeks, streams, dams	<p>The subject land contains one drainage line that joins with a tributary. The wider study area supports additional drainage lines / tributaries. The tributaries and drainage lines did not support any native or exotic riparian vegetation, and are only likely to convey water following substantial rain events.</p> <p>There are seven small to moderately sized dams in the study area, one of which occurs in the subject land.</p>	<p>The lack of permanent water and riparian vegetation indicates that the tributaries and drainage line are unlikely to provide habitat of significance to aquatic/riparian flora or fauna.</p> <p>The dams are unlikely to provide habitat of value to aquatic flora or fauna. They may be of some limited value to common native water birds (e.g. Australian Wood Duck <i>Chenonetta jubata</i>) and reptiles (e.g. Eastern Long-necked Turtle <i>Chelodina longicollis</i>).</p>

## 2.3.2 Threatened Biodiversity Databases

### 2.3.2.1 Definitions of conservation significance

The conservation significance of a species, population or community is determined by its current listing pursuant to Commonwealth and/or State legislation and associated policy, more specifically:

- National – Listed as threatened (critically endangered, endangered, vulnerable or conservation dependent) pursuant to the EPBC Act; and
- State (NSW) – Listed as threatened (endangered or vulnerable) pursuant to the BC Act.

Species listed as ‘migratory’ under the EPBC Act are also considered where relevant.

### 2.3.2.2 Database and literature review

Information regarding the suitability of the habitat in the study area for threatened species was obtained from the Threatened Biodiversity Data Collection (TBDC), BioNet (e.g. the profile of a threatened species), the BAM Calculator, listing determinations, and/or recovery plans prepared for the species by the Commonwealth Government and NSW Government. This information is used to assess the presence/absence of habitat constraints and/or microhabitats for species identified by DEECCW’s online EPBC Act Protected Matters Search Tool (PMST) or flagged by the BAM as ecosystem credits species and species credit species (refer to Section 2.3.3 and Section 2.3.4).

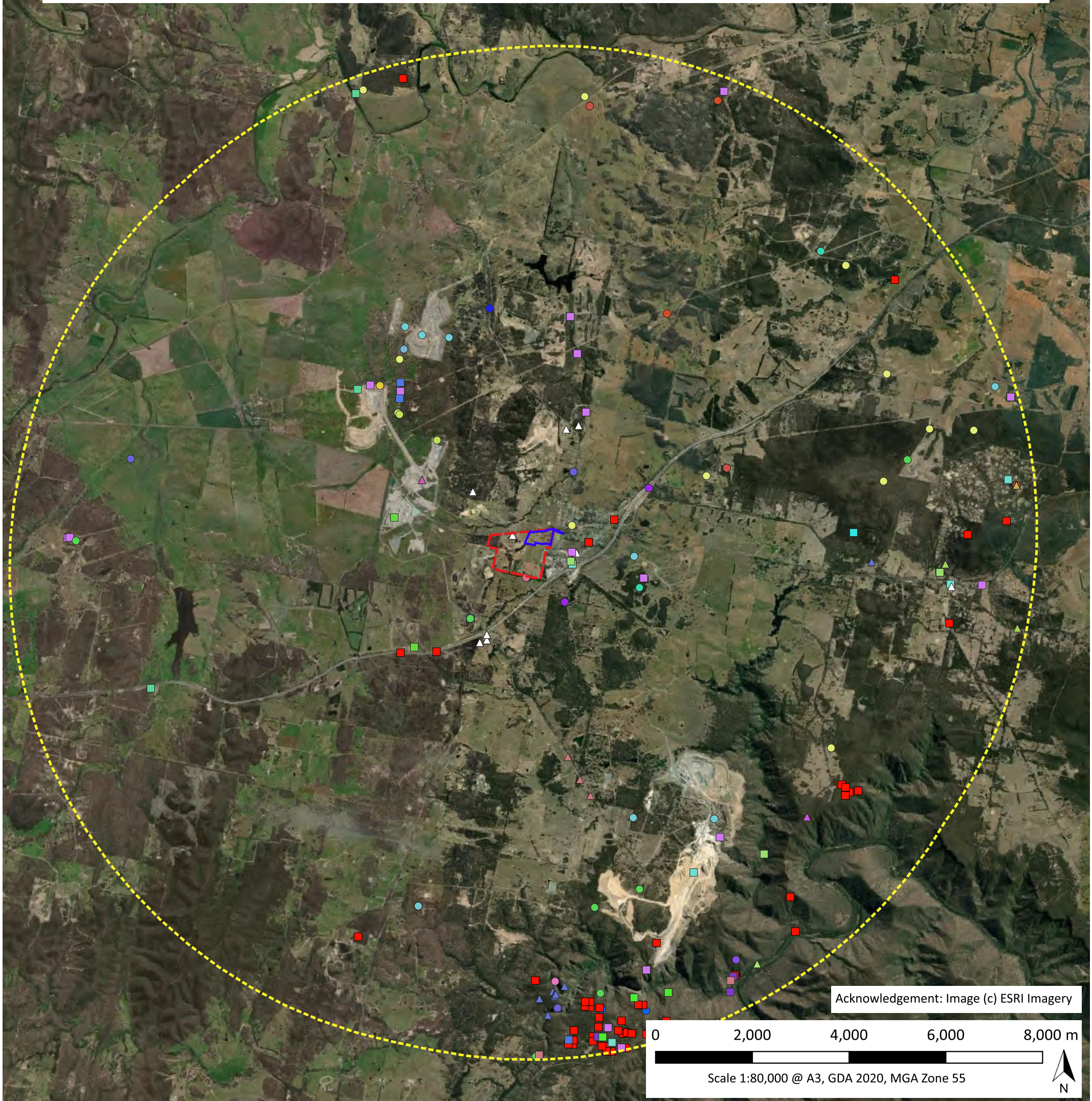
In addition, a database search and literature review were completed to inform likelihood of occurrence assessments and provide useful background information for this assessment. This review included obtaining:

- a list of threatened species (flora and fauna), threatened populations and threatened ecological communities (TECs) listed pursuant to the EPBC Act with the potential to occur in the study area obtained using the DCCEEW’s online EPBC Act Protected Matters Search Tool (PMST) on 9 July 2019, 22 September 2020, and updated on 2 June 2022; and
- ecological point data from the NSW Wildlife Atlas (BioNet), downloaded on 21 January 2022, providing a list of threatened species which have previously been recorded in the broad locality of the study area (i.e. within 10 km) (refer to Figure 8).

Literature referred to during the conduct of the surveys for this study and/or during the preparation of this BDAR is listed under References.

**Legend**

- Subject Land - Stage 3
  - Study Area - Lot 23 DP1256090
  - 10km Buffer to Subject Land - Stage 3
- NSW Wildlife Atlas Threatened Species - 10km Buffer
- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li><span style="color: purple;">●</span> Australasian Bittern</li> <li><span style="color: purple;">▲</span> Black Gum</li> <li><span style="color: teal;">●</span> Black-chinned Honeyeater (eastern subspecies)</li> <li><span style="color: teal;">●</span> Brown Treecreeper (eastern subspecies)</li> <li><span style="color: green;">■</span> Brush-tailed Rock-wallaby</li> <li><span style="color: blue;">▲</span> Bungonia Rice-flower</li> <li><span style="color: blue;">▲</span> Cotoneaster Pomaderris</li> <li><span style="color: lightblue;">●</span> Diamond Firetail</li> <li><span style="color: lightblue;">●</span> Dusky Woodswallow</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: green;">▲</span> Dwarf Kerrawang</li> <li><span style="color: blue;">■</span> Eastern Coastal Free-tailed Bat</li> <li><span style="color: red;">■</span> Eastern False Pipistrelle</li> <li><span style="color: red;">●</span> Flame Robin</li> <li><span style="color: yellow;">●</span> Gang-gang Cockatoo</li> <li><span style="color: purple;">●</span> Glossy Black-Cockatoo</li> <li><span style="color: cyan;">■</span> Greater Glider</li> <li><span style="color: lightgreen;">■</span> Grey-headed Flying-fox</li> <li><span style="color: white;">△</span> Hoary Sunray</li> <li><span style="color: pink;">●</span> Hooded Robin (south-eastern form)</li> <li><span style="color: red;">■</span> Koala</li> <li><span style="color: purple;">■</span> Large Bent-winged Bat</li> <li><span style="color: green;">■</span> Large-eared Pied Bat</li> </ul> | <ul style="list-style-type: none"> <li><span style="color: green;">■</span> Little Bent-winged Bat</li> <li><span style="color: purple;">●</span> Little Eagle</li> <li><span style="color: purple;">●</span> Little Lorikeet</li> <li><span style="color: blue;">●</span> Masked Owl</li> <li><span style="color: red;">▲</span> Matted Bush-pea</li> <li><span style="color: purple;">▲</span> Paddys River Box, Camden Woollybutt</li> <li><span style="color: green;">▲</span> Pale Pomaderris</li> <li><span style="color: red;">●</span> Powerful Owl</li> <li><span style="color: green;">●</span> Regent Honeyeater</li> <li><span style="color: green;">●</span> Scarlet Robin</li> <li><span style="color: purple;">●</span> Sooty Owl</li> <li><span style="color: red;">■</span> Southern Myotis</li> <li><span style="color: yellow;">●</span> Speckled Warbler</li> </ul> |
|---|--|---|
- |  |
|--|
| <ul style="list-style-type: none"> <li><span style="color: cyan;">■</span> Spotted-tailed Quoll</li> <li><span style="color: blue;">●</span> Square-tailed Kite</li> <li><span style="color: blue;">■</span> Squirrel Glider</li> <li><span style="color: red;">●</span> Swift Parrot</li> <li><span style="color: yellow;">▲</span> Tallong Midge Orchid</li> <li><span style="color: orange;">●</span> Turquoise Parrot</li> <li><span style="color: red;">●</span> Varied Sittella</li> <li><span style="color: orange;">●</span> White-bellied Sea-Eagle</li> <li><span style="color: yellow;">●</span> White-throated Needletail</li> <li><span style="color: yellow;">▲</span> Wingello Grevillea</li> <li><span style="color: purple;">■</span> Yellow-bellied Glider</li> <li><span style="color: green;">■</span> Yellow-bellied Sheath-tail-bat</li> </ul> |
|--|



**Figure 8. NSW Wildlife Atlas Threatened Species Search**

### 2.3.3 Habitat suitability for ecosystem credit species

Threatened species classified as ecosystem credit species and identified by the BAM as potentially occurring in the subject land are listed in Table 13. The value of the habitat in the subject land for ecosystem credit species is determined based on the type and condition (i.e. vegetation integrity) of the vegetation present together with the landscape context (refer to Section 2.1). The likelihood of these species occurring in the subject land is determined based the presence/absence of specific habitat constraints, geographic limitations, and vagrancy. Information regarding habitat constraints, geographic limitations, and vagrancy were obtained from the TBDC, BioNet (e.g. the profile of a threatened species), and through the BAM Calculator.

**Table 13. Predicted ecosystem credit species identified by the BAM as potentially occurring in the subject land.**

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Justification for exclusion
<i>Anthochaera phrygia</i> Regent Honeyeater (Foraging)	Critically Endangered	Critically Endangered	Yes – assumed	-
<i>Artamus cyanopterus cyanopterus</i> Dusky Woodswallow	Vulnerable	-	Yes – assumed	-
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo (Foraging)	Vulnerable	Endangered	Yes – assumed	-
<i>Calyptorhynchus lathami</i> Glossy Black-Cockatoo (Foraging)	Vulnerable	Vulnerable	Yes – assumed	-
<i>Chthonicola sagittata</i> Speckled Warbler	Vulnerable	-	Yes – assumed	-
<i>Climacteris picumnus victoriae</i> Brown Treecreeper (eastern subspecies)	Vulnerable	-	Yes – assumed	-
<i>Daphoenositta chrysoptera</i> Varied Sittella	Vulnerable	-	Yes – assumed	-

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Justification for exclusion
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	Vulnerable	Endangered	Yes – assumed	-
<i>Falco subniger</i> Black Falcon	Vulnerable	-	Yes – assumed	-
<i>Falsistrellus tasmaniensis</i> Eastern False Pipistrelle	Vulnerable	-	Yes – assumed	-
<i>Glossopsitta pusilla</i> Little Lorikeet	Vulnerable	-	Yes – assumed	-
<i>Grantiella picta</i> Painted Honeyeater	Vulnerable	Vulnerable	Yes – assumed	-
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle	Vulnerable	Vulnerable	Yes – assumed	-
<i>Hieraetus morphnoides</i> Little Eagle (Foraging)	Vulnerable	-	Yes – assumed	-
<i>Hirundapus caudacutus</i> White-throated Needletail	-	Vulnerable	Yes – assumed	-
<i>Lathamus discolor</i> Swift Parrot (Foraging)	Endangered	Critically Endangered	Yes – assumed	-
<i>Melanodryas cucullate</i> Hooded Robin (south-eastern form)	Vulnerable	-	Yes – assumed	-
<i>Melithreptus gularis</i> Black-chinned Honeyeater (eastern subspecies)	Vulnerable	-	Yes – assumed	-

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Justification for exclusion
<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat (Foraging)	Vulnerable	-	Yes – assumed	-
<i>Neophema pulchella</i> Turquoise Parrot	Vulnerable	-	Yes – assumed	-
<i>Ninox connivens</i> Barking Owl (Foraging)	Vulnerable	-	Yes – assumed	-
<i>Ninox strenua</i> Powerful Owl (Foraging)	Vulnerable	-	Yes – assumed	-
<i>Petaurus australis</i> Yellow-bellied Glider	Vulnerable	Vulnerable	Yes – assumed	-
<i>Petroica boodang</i> Scarlet Robin	Vulnerable	-	Yes – assumed	-
<i>Petroica phoenicea</i> Flame Robin	Vulnerable	-	Yes – assumed	-
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	Vulnerable	Vulnerable	Yes – assumed	-
<i>Stagonopleura guttata</i> Diamond Firetail	Vulnerable	-	Yes – assumed	-
<i>Tyto novaehollandiae</i> Masked Owl (Foraging)	Vulnerable		Yes – assumed	-
<i>Varanus rosenbergi</i> Rosenberg's Goanna	Vulnerable		Yes – assumed	-

### 2.3.4 Habitat suitability for species credit species

#### 2.3.4.1 Candidate species credit species

Threatened species classified as species credit species and identified by the BAM as potentially occurring in the subject land are listed in Table 14. The value of the habitat in the subject land for species credit species is determined based on the type and condition (i.e. vegetation integrity) of the vegetation present together with the landscape context (refer to Section 2.1). The likelihood of these species occurring in the subject land is determined based the presence/absence of specific habitat constraints, microhabitat requirements, geographic limitations, vagrancy, species records (BioNet and ecological reports), and/or the results of targeted surveys. Information regarding habitat constraints, microhabitat requirements, geographic limitations, and vagrancy were obtained from the TBDC, BioNet (e.g. the profile of a threatened species), and through the BAM Calculator. A summary of the findings from each targeted survey is given in Section 2.3.4.2.

**Table 14. Candidate species credit species identified by the BAM as potentially occurring in the subject land.**

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
<i>Anthochaera phrygia</i> Regent Honeyeater (Breeding)	Critically Endangered	Critically Endangered	This species inhabits dry open forest and woodland (particularly Box-Ironbark woodland and riparian forests of River Sheoak) that have significantly large numbers of mature trees, high canopy cover, and abundance of mistletoes. The species breeds in Box-Ironbark and other temperate woodlands, and in riparian gallery forest dominated by River Sheoak. The species usually nests in tall mature eucalypts, Sheoaks, or mistletoe haustoria. There are only three known key breeding regions: north-east Victoria (Chiltern-Albury) and NSW (Capertee Valley and the Bundarra-Barraba region). The TBDC lists 'as per important habitat map' as a breeding habitat constraint for this species.	No – habitat constraint	The subject land is not identified on the 'BAM – Important Areas viewer' map <sup>27</sup> . <u>Conclusion - the subject land lacks the breeding habitat constraints required for this species.</u>
<i>Aprasia parapulchella</i> Pink-tailed Legless Lizard	Vulnerable	Vulnerable	This species inhabits sloping, open woodland areas with predominantly native grassy ground layers, particularly those dominated by Kangaroo Grass. Sites are typically well-drained, with rocky outcrops or scattered, partially buried rocks. The TBDC lists 'rocky areas or within 50 m of rocky areas' as a habitat constraint for this species. Some of the main threats to this species listed in the TBDC are habitat loss through bush-rock removal and vegetation clearing for agricultural purposes (e.g. pasture improvement including slashing, ploughing, and sowing of non-native species), overgrazing by domestic stock, and invasion of habitat by weeds.	No – habitat constraint, habitat degraded	The groundstorey across almost the entire subject land has been cultivated and was sown to cereal crops or pasture. This has involved the removal of suitable rocky habitat for Pink-tailed Worm-lizard and complete disturbance of the soil profile. The subject land therefore lacks the required habitat constraints and has therefore been disturbed to the extent that the species is considered unlikely to occur. Finally, the species has not been recorded in the locality. <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Callocephalon fimbriatum</i> Gang-gang Cockatoo (Breeding)	Vulnerable	Endangered	In spring and summer, this species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Gang-Gang Cockatoos favour old growth forest and woodland for nesting and roosting. The TBDC lists 'Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger' as a breeding habitat constraint for this species.	No – habitat constraint, surveyed	The subject land does not contain potential breeding habitat (i.e. hollow bearing trees). Furthermore, the wider study area does not support tall mountain forests or woodlands, heavily timbered or mature wet sclerophyll forests, or old growth forest or woodland. In addition, the grassy forest across the subject land is heavily degraded as approximately 89% of the overstorey has been cleared and the midstorey and shrubstorey are almost entirely absent. Finally, targeted bird surveys were conducted across the subject land and wider study area in the patches of more intact woody vegetation, and remnant trees were assessed for the presence/absence of habitat features and for signs of fauna nesting in hollows (Figure 10). No Gang-gang Cockatoos were recorded in the study area and no sign of Gang-gang Cockatoos nesting in tree hollows was detected. <u>Conclusion – the subject land lacks the breeding habitat constraints required for this species.</u>

<sup>27</sup> [https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM\\_ImportantAreas](https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas)



Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
<i>Calyptorhynchus lathami</i> Glossy Black-Cockatoo (Breeding)	Vulnerable	Vulnerable	This species inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of Sheoak occur. Black Sheoak <i>Allocasuarina littoralis</i> and Forest Sheoak <i>Allocasuarina torulosa</i> are important foods. Inland populations feed on a wide range of Sheoaks, including Drooping Sheoak, <i>Allocasuarina diminuta</i> and <i>A. gymnathera</i> . Belah ( <i>Casuarina cristata</i> ) is also utilised and may be a critical food source for some populations. In the Riverina, birds are associated with hills and rocky rises supporting Drooping Sheoak, but also recorded in open woodlands dominated by Belah. The species is dependent on large hollow-bearing eucalypts for nest sites and a single egg is laid between March and May. The TBDC lists 'Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground' as a breeding habitat constraint for this species and notes that 'the species may need larger patches and more intact landscapes for breeding.'	No – habitat constraints	The subject land does not contain potential breeding habitat (i.e. hollow bearing trees). In addition, the grassy woodland across the study area is heavily degraded as approximately 89% of the overstorey has been cleared and the midstorey and shrubstorey are almost entirely absent. Finally, targeted bird surveys were conducted across the subject land and wider study area in the patches of more intact woody vegetation, and remnant trees were assessed for the presence/absence of habitat features and for signs of fauna nesting in hollows (Figure 10). No Glossy Black-Cockatoos were recorded in the study area and no sign of Glossy Black-Cockatoos nesting in tree hollows was detected. <u>Conclusion – the subject land lacks the breeding habitat constraints required for this species.</u>
<i>Cercartetus nanus</i> Eastern Pygmy-possum	Vulnerable	-	This species is found in a broad range of habitats, but in most areas woodlands and heath appear to be preferred. It feeds primarily on nectar and pollen collected from banksias, eucalypts, and bottlebrushes, but also feeds on insects throughout the year. The species shelters in tree hollows, rotten stumps, holes in the ground, abandoned bird-nests, Ringtail Possum dreys, or thickets of vegetation, (e.g. grass-tree skirts). Tree hollows are favoured for breeding. The TBDC lists 'declining shrub diversity in forests and woodlands due to overgrazing by stock and rabbits', 'predation from cats, dogs and foxes', and 'loss of nest sites due to removal of firewood' as some of the key threats to the species.	No – habitat degraded	Field surveys of the vegetation in the study area did not record any banksias or bottlebrushes (Appendix B). The vast majority of the subject land has been historically cleared and the surface soil layer scraped, flattened, and compacted. As a result, there are no mature trees, fallen timber, or holes in the ground which could be used by the species for shelter. A tree habitat assessment did not record any functional hollows, stick nests, or Ringtail Possum dreys in the subject land. As such, the subject land lacks the primary microhabitat features required for this species. The habitat is therefore degraded to the extent that the species is unlikely to utilise the subject land. <u>Conclusion – the species is considered unlikely to occur in the study area.</u>
<i>Chalinolobus dwyeri</i> Large-eared Pied Bat	Vulnerable	Vulnerable	This species is found mainly in area with extensive cliffs and caves and roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin <i>Petrochelidon ariel</i> , frequenting low to mid-elevation dry open forest and woodland close to these features. The species is often found in well-timbered areas containing gullies. The TBDC lists 'Within two kilometres of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within two kilometres of old mines or tunnels' as a habitat constraint for this species.	No – habitat constraint	The subject land does not support well-timbered areas containing gullies and does not occur within 2km of potential roosting habitat (cliffs, caves, old mine workings, etc.). <u>Conclusion – the subject land lacks the habitat constraints required for this species.</u>
<i>Haliaeetus leucogaster</i> White-bellied Sea-Eagle (Breeding)	Vulnerable	-	Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. The TBDC lists 'living or dead mature trees in suitable vegetation within 1km of a river, lake, large dam, creek, wetland, or coastline' as a breeding habitat constraint.	No – surveyed	Remnant trees were assessed for the presence/absence of habitat features and for signs of fauna nesting in stick nests. While White-bellied Sea Eagles have been recorded within 1 km of the subject land and may occasionally visit to forage, no White-bellied Sea-Eagles or appropriate stick nests were recorded in the subject land. <u>Conclusion – the species is considered unlikely to breed in the subject land.</u>
<i>Heleioporus australiacus</i> Giant Burrowing Frog	Vulnerable	Vulnerable	The species is found in heath, woodland, and open dry sclerophyll forest on a variety of soil types except those that are clay based. It spends more than 95% of its time in non-breeding habitat in areas up to 300 m from breeding sites. Whilst in non-breeding habitat it burrows below the soil surface or in the leaf litter. Breeding habitat of this species is generally soaks or pools within first or second order streams. They are also commonly recorded from 'hanging swamp' seepage lines and where small pools form from the collected water. When breeding, frogs will call from open spaces, under vegetation or rocks or from within burrows in the creek bank. The TBDC notes that the 'species is dependent on hanging swamps on the top of sandstone plateaus and deeply dissected gullies that occur as erosion features in the Sydney Basin.'	No – microhabitat features	The subject land supports one ephemeral drainage line and one small farm dam, both of which lacks native fringing vegetation. The subject land does not contain potential habitat for the species as it lacks permanent streams, rivers, other suitable waterbodies, and riparian habitat. <u>Conclusion – the subject land does not support characteristically suitable habitat for the species.</u>

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
<i>Hieraetus morphnoides</i> Little Eagle (Breeding)	Vulnerable	-	This species occupies open eucalypts forest, woodland, or open woodland. Sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW are also used. The species nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. The TBDC ' <i>Nest trees - live (occasionally dead) large old trees within vegetation</i> ' as a breeding habitat constraint for this species.	No – surveyed	Targeted bird surveys were conducted across the subject land and wider subject land in the patches of more intact woody vegetation, and remnant trees were assessed for the presence/absence of habitat features and for signs of fauna nesting in stick nests (Figure 10). No large stick nests or Little Eagles were recorded in the subject land. <u>Conclusion – the species is considered unlikely to breed in the subject land.</u>
<i>Isoodon obesulus obesulus</i> Southern Brown Bandicoot (eastern)	Endangered	Endangered	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River. The species is generally only found in heath or open forest with a heathy understorey on sandy or friable soils. They nest during the day in a shallow depression in the ground covered by leaf litter, grass or other plant material. Nests may be located under Grass trees <i>Xanthorrhoea</i> spp., blackberry bushes and other shrubs, or in rabbit burrows. The TBDC lists ' <i>Requires dense ground cover in a variety of habitats</i> ' as a habitat constraint for this species.	No – habitat degraded	The grassy forest across the subject land is heavily degraded as approximately 89% of the overstorey has been cleared and the midstorey and shrubstorey are almost entirely absent. In addition, the vast majority of the subject land has been historically cleared and the surface soil layer scraped, flattened, and compacted. The subject land therefore lacks the required habitat constraints and has been disturbed to the extent that the species is considered unlikely to occur. Finally, the species has not been recorded in the locality. <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Lathamus discolor</i> Swift Parrot (Breeding)	Endangered	Critically Endangered	This species breeds in Tasmania from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum <i>Eucalyptus globulus</i> . The species migrates between February and October to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. On the mainland, they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. In NSW, the species mostly occurs on the coast and south west slopes. The TBDC lists ' <i>as per Important Habitat Map</i> ' as a breeding habitat constraint for this species.	No – habitat constraint	The subject land is not identified on the 'BAM – Important Areas viewer' map <sup>28</sup> . <u>Conclusion - the subject land lacks the breeding habitat constraints required for this species.</u>
<i>Leucochrysum albicans</i> subsp. <i>tricolor</i> Hoary Sunray	Endangered	Endangered	This species occurs in a wide variety of grassland, woodland, and forest habitats, generally on relatively heavy soils. It can occur in modified habitats such as semi-urban areas and roadsides. It is highly dependent on the presence of bare ground for germination, and in some areas disturbance is required for successful establishment.	No – surveyed	While the species was recorded in the wider study area, targeted surveys confirmed that the species does not occur in the subject land. <u>Conclusion – the species is not present in the subject land.</u>
<i>Litoria booroolongensis</i> Booroolong Frog	Endangered	Endangered	This species lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble (stony) banks and other rock structures within stream margins and shelter under rocks or amongst vegetation near the ground on the stream edge. Eggs are laid in submerged rock crevices and tadpoles grow in slow-flowing connected or isolated pools. The TBDC lists erosion / sedimentation impacting stream channels, cobble banks, native streamside vegetation, and stream margins as the primary threat to the species.	No – microhabitat features.	The subject land does not contain potential habitat for the species as it lacks permanent streams, rivers, other suitable waterbodies, and riparian habitat. <u>Conclusion – the subject land does not support characteristically suitable habitat for the species.</u>
<i>Miniopterus orianae oceanensis</i> Large Bent-winged Bat (Breeding)	Vulnerable	-	Caves are the primary roosting habitat, but the species also use derelict mines, storm-water tunnels, buildings, and other man-made structures. The species forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young. Maternity caves have very specific temperature and humidity regimes. Breeding or roosting colonies can number from 100 to 150,000 individuals. The TBDC list the following breeding habitat constraint, ' <i>Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records with microhabitat code "IC - in cave", observation type code "E nest-roost", with numbers of individuals &gt;500.</i> '	No – habitat constraint	The subject land does not contain potential breeding habitat (caves, tunnels, mines, culverts, etc.). <u>Conclusion – the subject land lacks the breeding habitat constraints required for this species.</u>

<sup>28</sup> [https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM\\_ImportantAreas](https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas)

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
<i>Mixophyes balbus</i> Stuttering Frog	Endangered	Vulnerable	Stuttering Frogs occur along the east coast of Australia from southern Queensland to north-eastern Victoria. It is the only <i>Mixophyes</i> species that occurs in south-east NSW and in recent surveys it has only been recorded at three locations south of Sydney.  Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Outside the breeding season adults live in deep leaf litter and thick understorey vegetation on the forest floor. Breed in streams during summer after heavy rain. Eggs are laid on rock shelves or shallow riffles in small, flowing streams. As the tadpoles grow they move to deep permanent pools and take approximately 12 months to metamorphose.	No - microhabitat features	The subject land does not contain 'rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range' or small flowing streams.  <u>Conclusion – the subject land does not support characteristically suitable habitat for the species.</u>
<i>Myotis macropus</i> Southern Myotis	Vulnerable	-	The Southern Myotis occurs from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. The species roosts close to water in caves, hollow-bearing trees, man-made structures (bridges, culverts etc) and in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. The species is dependent on waterways (i.e. medium to large permanent creeks, rivers, lakes, or other waterways with pools/stretchers 3 m wide or greater <sup>29</sup> ), where it catches aquatic insects and small fish with their large hind claws, and also catches flying insects. The TBDC lists 'Waterbodies with permanent pools/stretchers 3m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other, on or within 200m of the site' as habitat constraints for this species.	No – habitat constraint	There are no suitable major water bodies in the subject land or adjacent areas. The subject land therefore land lacks the habitat constraints required for this species.  <u>Conclusion - the species is considered unlikely to occur in the subject land.</u>
<i>Ninox connivens</i> Barking Owl (Breeding)	Vulnerable	-	This species inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. During nesting season, the male perches in a nearby tree overlooking the hollow entrance. Two or three eggs are laid in hollows of large, old trees. Living eucalypts are preferred though dead trees are also used. Nest sites are used repeatedly over years by a pair. Nesting occurs during mid-winter and spring, being variable between pairs and among years. As a rule of thumb, laying occurs during August and fledging in November. The female incubates for 5 weeks, roosts outside the hollow when chicks are 4 weeks old, then fledging occurs 2-3 weeks later. The TBDC lists 'living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground' as a breeding habitat constraint for this species.	No – habitat constraint	The subject land does not contain potential breeding habitat (i.e. hollow bearing trees).  <u>Conclusion – the subject land lacks the breeding habitat constraints required for this species.</u>
<i>Ninox strenua</i> Powerful Owl (Breeding)	Vulnerable	-	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The species requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. Powerful Owls nest in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him. The TBDC lists 'living or dead trees with hollow greater than 20 cm diameter' as a breeding habitat constraint.	No – habitat constraint	The subject land does not contain potential breeding habitat (i.e. hollow bearing trees).  <u>Conclusion – the subject land lacks the breeding habitat constraints required for this species.</u>

<sup>29</sup> Anderson, J., Law, B., and Tidemann (2005). *Stream use by the Large-footed Myotis Myotis Macropus in relation to environmental variables in Northern New South Wales*. Australian Mammalogy 28:15-26.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
<i>Petauroides volans</i> Southern Greater Glider	Endangered	Endangered	The Southern Greater Glider occurs in eastern Australia, in eucalypt forests and woodlands, where it has a broad distribution from around Proserpine in Queensland, south through NSW and the Australian Capital Territory into Victoria. The Southern Greater Glider is an arboreal nocturnal marsupial that feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Individuals occupy relatively small home ranges, with an average size of 1 ha to 3 ha.	No – habitat degraded, microhabitat features	Much of the subject land has been historically cleared. As a result, there are only thinned, isolated patches of mature trees. The midstorey and shrubstorey are entirely absent. A tree habitat assessment found that none of the trees in the subject land contain functional hollows. As such, the subject land lacks the microhabitat features required for this species. Finally, targeted nocturnal fauna surveys across the subject land and wider study area did not detect the species (Figure 11). <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Petaurus norfolcensis</i> Squirrel Glider	Vulnerable	-	West of the Great Diving Range, this species inhabits mature or old growth Box, Box-Ironbark woodlands, and River Red Gum forest. It prefers mixed species stands with a shrub or Acacia midstorey. The species requires abundant tree hollows for refuge and nest sites and generally relies on large old trees with hollows for breeding and nesting. These trees are also critical for movement and typically need to be closely connected (i.e. no more than 50 m apart). The TBDC lists 'Loss of hollow-bearing trees' and 'Loss of understorey food resources' as some of the key threats to this species.	No – habitat degraded, microhabitat features, surveyed	Much of the subject land has been historically cleared. As a result, there are only thinned, isolated patches of mature trees. The midstorey and shrubstorey are entirely absent. A tree habitat assessment found that none of the trees in the subject land contain functional hollows. As such, the subject land lacks the microhabitat features required for this species. Finally, targeted nocturnal fauna surveys across the subject land and wider study area, which included call playback for Squirrel Glider, did not detect the species (Figure 11). <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Petrogale penicillata</i> Brush-tailed Rock-wallaby	Endangered	Vulnerable	This species occupies rocky escarpments, outcrops, and cliffs, with a preference for complex structures with fissures, caves, and ledges (often facing north). The species is highly territorial and have strong site fidelity with an average home range size of about 15 ha. The TBDC lists 'land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines' as a habitat constraint for this species.	No – habitat constraint	The subject land does not support or occur within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines. <u>Conclusion – the subject land lacks the habitat constraints required for this species.</u>
<i>Phascogale tapoatafa</i> Brush-tailed Phascogale	Vulnerable	-	The Brush-tailed Phascogale has a patchy distribution around the coast of Australia. In NSW it is mainly found east of the Great Dividing Range although there are occasional records west of the divide. This species prefers dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. It also inhabits heath, swamps, rainforest, and wet sclerophyll forest. It is an agile climber foraging preferentially in rough barked trees of 25 cm DBH or greater. The species nests and shelters in tree hollows with entrances 2.5 – 4 cm wide and uses many different hollows over a short time span. The TBDC lists 'Loss of hollow-bearing trees' and 'Predation by foxes and cats' as some of the key threats to this species.	No – microhabitat features, habitat degraded	The subject land and wider study area do not support heath, swamps, rainforest, or wet sclerophyll forest. In addition, the subject land does not support any hollow-bearing trees and the species has not been recorded within 10 km of the subject land. As such, the subject land lacks the primary microhabitat features required for this species and has been degraded to the extent that the species is considered unlikely to occur. <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Phascolarctos cinereus</i> Koala	Endangered	Endangered	This species inhabits eucalypt woodlands and forests, feeding on the foliage of more than 70 eucalypt species and 30 non-eucalypt species. Home range size varies with quality of habitat, ranging from less than 2 hectares to several hundred hectares in size. The TBDC lists 'Presence of koala use trees - refer to the Koala ( <i>Phascolarctos cinereus</i> ): Biodiversity Assessment Method Survey Guide for information on targeted survey requirements and mapping species polygons' as a habitat constraint for breeding for this species.	No – habitat constraint, habitat degraded	The majority of subject land has been historically cleared and the remaining vegetation is thinned, fragmented, and isolated (Figure 6). The midstorey and shrubstorey are entirely absent. In addition, no Koalas or signs of Koala presence were detected during the surveys conducted for this BDAR or by previous ecological surveys of Lot 23 DP1256090 (see Section 1.2). The degraded vegetation combined with the lack of Koala observations to the west of the Hume Highway indicates that the subject land could not be classified as occupied Koala habitat. <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Pomaderris cotoneaster</i> Cotoneaster Pomaderris	Endangered	Endangered	Cotoneaster Pomaderris has a very disjunct distribution, being known from the Nungatta area, northern Kosciuszko National Park (near Tumut), the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, the Yerranderie area, Kanangra-Boyd National Park, the Canyonleigh area and Ettrema Gorge in Morton National Park. This species has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.	No – surveyed	Targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the study area during the development of this BDAR (Section 2.3.4.2, Figure 10). The species was not recorded in the subject land or wider study area. <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox (Breeding)	Vulnerable	Vulnerable	Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating, and for giving birth and rearing young. Site fidelity to camps is high; some camps have been used for over a century. The TBDC lists 'breeding camps' as a breeding habitat constraint for this species.	No – habitat constraint	The species has been recorded near the subject land and may visit the area to forage. However, field surveys confirmed that the subject land and wider study area do not support breeding camps. <u>Conclusion – the subject land lacks the breeding habitat constraints required for this species.</u>
<i>Pultenaea pedunculata</i> Matted Bush-pea	Endangered	-	In NSW, the species is represented by only three disjunct populations: in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui, and the Windellama area south of Goulburn (where it is locally abundant). The Matted Bush-pea occurs in a range of habitats. NSW populations are generally among woodland vegetation, but plants have also been found on road batters and coastal cliffs. It is largely confined to loamy soils in dry gullies in populations in the Windellama area. The ability of stems to creep and root from the nodes has made this species a very good coloniser of bare ground in many parts of its range. The BAM Calculator lists 'Between Boro and Marulan' as a geographic limitation for this species.	No – geographic limitation, surveyed	The subject land is not between Boro and Marulan. In addition, targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the study area during the development of this BDAR (Section 2.3.4.2, Figure 10). The species was not recorded in the subject land or wider study area. <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Solanum armourense</i> Solanum armourense	Endangered	-	Confined to a relatively small area west and southwest of Sydney, from the Kowmung Valley within Blue Mountains and Kanangra Boyd national parks south to the Wombeyan area. Occurs in eucalypt woodland, in shallow soil on steep rocky hillsides. Flowers August to May, peaking in warmer months. Occurrences of the species appear to reflect the presence of limestone (either as an outcrop or lime-rich metamorphic sediments) and associate with landforms that reflect the presence of limestone / calcite-rich sediments.	No – microhabitat features, surveyed	The subject land is not within the known range of the species, does not support shallow soils on steep rock hillsides, does not support limestone outcrops or lime-rich metamorphic sediments, and the species was not detected during targeted surveys. <u>Conclusion – the species is considered unlikely to occur in the subject land.</u>
<i>Tyto novaehollandiae</i> Masked Owl (Breeding)	Vulnerable	-	This species lives in dry eucalypt forests and woodlands from sea level to 1100 m. The species roosts and breeds in moist eucalypt forested gullies, using large tree hollows. Dead stags are especially popular for roosting/breeding habitat and are a limited resource due to natural attrition. The TBDC lists 'living or dead trees with hollows greater than 20cm diameter' as a breeding habitat constraint for this species.	No – habitat constraint	The subject land does not contain potential breeding habitat (i.e. hollow bearing trees). <u>Conclusion – the subject land lacks the breeding habitat constraints required for this species.</u>

#### **2.3.4.2 BAM targeted survey results**

As described in Table 14, targeted surveys were completed to confirm the occurrence and/or habitat potential for the species credit species flagged by the BAM as having the potential to occur in the relevant PCT of the subject land.

##### **Threatened flora**

As detailed in Table 14, all of the threatened flora species credit species flagged by the BAM are considered unlikely to occur in the majority of the subject land given the vegetation is highly disturbed (i.e. PCT3486 Zone 3 and Zone 4), shows signs of historic cultivation and/or pasture improvement, supports a variety of weeds, has been heavily grazed over an extended period by stock, and is currently moderately to heavily grazed by stock and Eastern Grey Kangaroos.

PCT3486 Zone 1, and other patches in the wider study area, support relatively intact vegetation that has the potential to support threatened flora species. Accordingly, targeted threatened flora transects were conducted across these areas (Figure 9).

A total of 58 flora species were recorded during the 2019 field surveys, comprising 33 native species and 25 exotic species (Appendix B). The 2022 BAM plots and associated surveys recorded a total of 49 flora species, comprising 22 native species and 27 exotic species. The combined flora surveys recorded a total of 82 flora species, comprising 45 native species and 37 exotic species.

One BC Act / EPBC Act listed threatened species, Hoary Sunray, was recorded in the south-western corner and north-western corner of the study area (Figure 9). In total, approximately 30 plants were recorded in the south-western population and greater than 1,000 plants in the north-western population. In total, 0.62 ha of Hoary Sunray habitat was mapped across the study area. The proposed development of the subject land will not impact either population, and will therefore not impact upon Hoary Sunray.

None of remaining threatened flora species credit species identified in Table 14 were recorded in the subject land and none are considered likely to occur.

##### **Threatened fauna**

A total of 16 native fauna species were recorded during field surveys, comprising 12 bird species, 1 amphibian species, and 3 mammal species (Appendix D). No threatened fauna species were detected in the subject land or study area for this BDAR during field surveys.

##### **Threatened birds**

A total of 14 bird species were recorded across all surveys, comprising 12 native species and 2 exotic species (Appendix D). No threatened bird species were recorded.

None of the threatened candidate species credit species identified in Table 14 were, or have previously been, recorded nesting/breeding in the subject land or study area.

In light of the above, all of the threatened bird species credit species flagged by the BAM are considered unlikely to breed in the subject land or study area.

### **Nocturnal fauna**

A total of 10 fauna species were recorded during nocturnal surveys, comprising 8 native species and 2 exotic species (Appendix D).

None of the threatened candidate species credit species identified in Table 14 were, or have previously been, recorded in the subject land or study area.

In light of the above, all of the threatened nocturnal fauna species credit species flagged by the BAM are considered unlikely to occur in the subject land or study area.



Acknowledgement: Image (c) NSW LPI 2022

0 100 200 300 400 m

Scale 1:5,750 @ A3, GDA 2020, MGA Zone 55

Figure 9. Threatened Flora Survey Results

Capital Ecology Project No: 3148  
 Drawn by: S. Thompson  
 Date: 9 August 2022





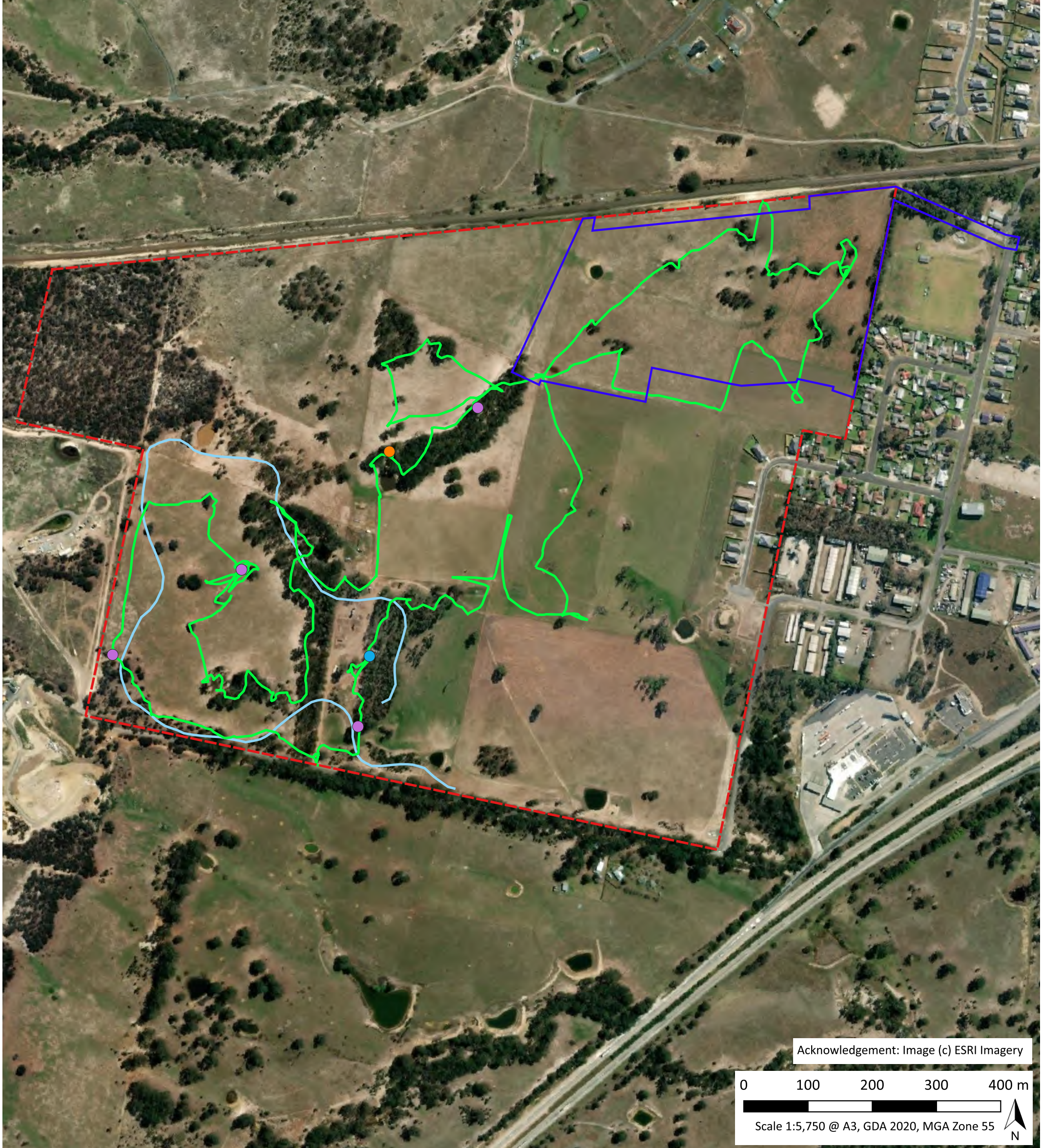
**Legend**

- Subject Land - Stage 3
- Study Area - Lot 23 DP1256090

**Hollow Bearing Trees**

- Cabbage Gum
- Candlebark
- Thin-leaved Stringybark

- Tree Habitat Assessment and Fauna Nesting Survey - 6 November 2019
- Bird Survey - 4 December 2019



Acknowledgement: Image (c) ESRI Imagery

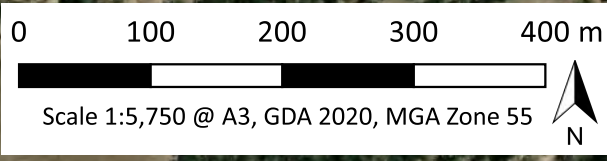


Figure 10. Tree Habitat Assessment, Fauna Nesting Survey, and Bird Survey Results

Capital Ecology Project No: 3148  
 Drawn by: C. Ross  
 Date: 27 June 2023



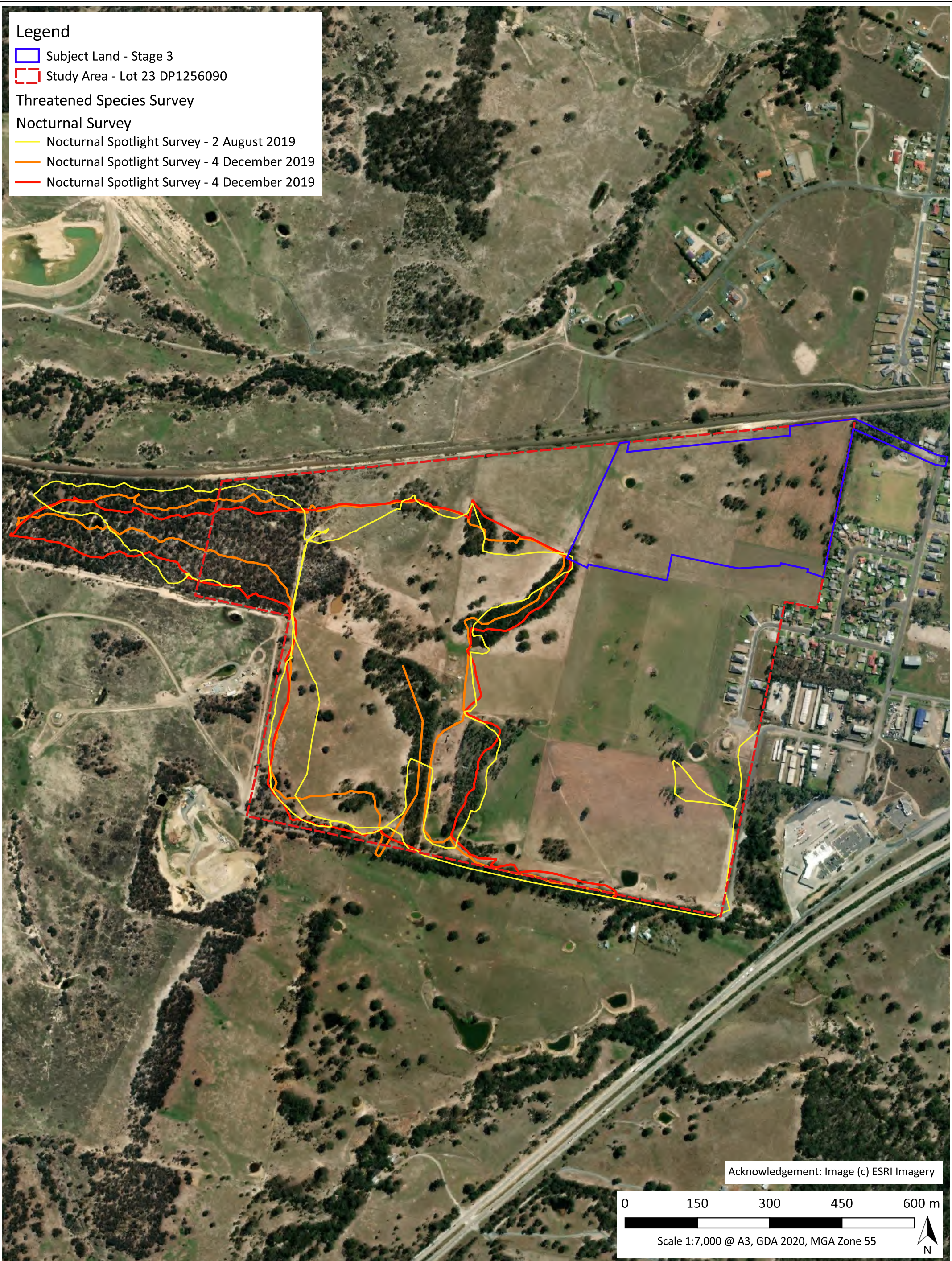
**Legend**

- ▭ Subject Land - Stage 3
- ▭ Study Area - Lot 23 DP1256090

**Threatened Species Survey**

**Nocturnal Survey**

- Nocturnal Spotlight Survey - 2 August 2019
- Nocturnal Spotlight Survey - 4 December 2019
- Nocturnal Spotlight Survey - 4 December 2019



Acknowledgement: Image (c) ESRI Imagery

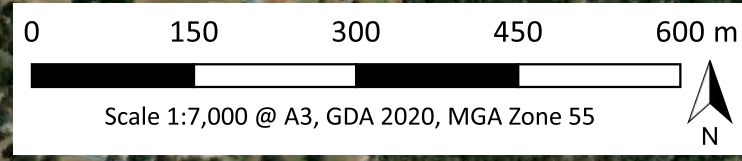


Figure 11. Nocturnal Spotlight and Call Playback Survey

Capital Ecology Project No: 3148  
 Drawn by: C. Ross  
 Date: 27 June 2023



## 3 Part 2 – Impact Assessment (BAM Stage 2)

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Part 2 of this BDAR provides an assessment of the impacts of the proposed development as set out in Stage 2 of the BAM.

### 3.1 Avoidance and Minimisation of Impacts on Biodiversity Values

In accordance with the BAM, a proponent is required to demonstrate that all reasonable and practicable measures have been employed to avoid and minimise the impacts of a project on biodiversity values. Accordingly, this section outlines the avoidance and minimisation measures that have been incorporated into the project design of the proposed development.

#### 3.1.1 Location

##### 3.1.1.1 Locating the project where there are low or no biodiversity values

The majority of the subject land is moderately to highly disturbed, shows signs of historic cultivation and/or pasture improvement, supports a variety of weeds, has been heavily grazed over an extended period by stock, and is currently moderately to heavily grazed by stock and Eastern Grey Kangaroo.

The crown road reserve (PCT3486 Zone 1) supports the most intact vegetation in the subject land. This zone supports a remnant canopy, with a midstorey and shrubstorey over a native groundstorey with a moderate diversity of native forbs. The remnant trees in isolated patches (PCT3486 Zone 3) are the only other substantial natural feature within the proposed development footprint. The proposed development will not retain the vegetation in the crown road reserve or the isolated patches of trees of Zone 3.

No part of the subject land supports habitat for any threatened flora or fauna and the vegetation in the subject land is only likely to provide limited habitat for the common native birds, reptiles, and herbivorous mammals that occur in the locality. The proposed development has therefore been located in an area where historical disturbance is high and biodiversity values are lowest.

Given the highly degraded vegetation and habitat values of the majority of the subject land, the subject land is considered a suitable area for residential development. While the proposed development will not retain trees within the development footprint, as mentioned above, locating the development as proposed will avoid and minimise impacts to the ecological values of the wider study area and surrounding properties.

##### 3.1.1.2 Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition

As mentioned previously, the western half of Lot 23 DP1256090 (which does not include the subject land but does include the western portion of the study area) contains substantial patches of more intact remnant vegetation which support Hoary Sunray and may support a number of the threatened flora or threatened fauna that have the potential to occur in the locality. These areas will not be impacted by the proposed development.

In contrast, most of the vegetation across the subject land is highly disturbed given that 79% has been historically cleared and is now entirely dominated by exotic grasses and weeds (i.e. PCT3486 Zone 4). The remaining areas (i.e. PCT3486 Zone 1 Zone 3), while supporting remnant canopy (both zones) and some midstorey/shrubstorey (Zone 1 only) are still moderately disturbed and currently support a variety of perennial and annual exotic grasses and weeds.

The proposed development has therefore been located in areas where the native vegetation and habitat is in the poorest condition.

### **3.1.1 Design**

#### **3.1.1.3 Locating ancillary facilities in areas: where there are no biodiversity values; where the native vegetation or threatened species habitat is in the poorest condition; and that avoid habitat for species and vegetation in high threat status categories**

Given that the proposed development is located immediately adjacent to existing urban development (i.e. Marulan township), many of the biodiversity impacts associated with a new development will be reduced (i.e. impacts related to services, roads, bushfire protection, flood planning, etc.). In addition, all ancillary facility associated with the construction and operation of the proposed development will be located to avoid all of the significant biodiversity values that will be retained by the proposed development.

## **3.2 Residual Biodiversity Impacts of the Proposed Development**

### **3.2.1 Direct impacts on native vegetation and habitat**

The proposed development will result in the clearance of:

- 0.21 ha of PCT3486 Zone 1 – canopy, regeneration, native dominant understorey, moderate native forb diversity (BC Act native vegetation).
- 1.31 ha of PCT3486 Zone 3 – canopy, exotic dominant understorey, low native forb diversity (BC Act native vegetation).

In total, the proposed development will result in the clearance of 1.52 ha of BC Act native vegetation.

The proposed development will also result in the clearance of:

- 12.38 ha of PCT3486 Zone 4 – low diversity exotic pasture.

The 12.38 ha of PCT3486 Zone 4 is clearly dominated by exotic grasses and forbs, does not meet the definition of BC Act native vegetation, and is not identified as habitat for threatened species.

### **3.2.2 Indirect impacts on native vegetation and habitat**

The proposed development has the potential to indirectly impact retained or adjacent native vegetation and habitat. Potential indirect impacts are listed below.

- Increased sedimentation of receiving waterways during construction.
- Increased noise, vibration, and dust during construction.
- Weed introduction and/or spread during construction and occupation.
- Incidental damage or removal of retained native vegetation and habitat during construction and occupation.
- Increase in pest animal populations as a result of increased human activity during occupation.

The above potential indirect impacts could occur during the construction and/or occupation of the subject land and are likely to reduce the extent and/or condition of the surrounding native vegetation and habitat. This may occur in the short-term during the construction phase of the proposed development and in the long-term during the occupation phase of the proposed development.

However, the proposed development reduces the likelihood of indirect impacts by enacting the following principles detailed in Section 3.1 to avoid and minimise impacts to native vegetation and habitat.

- Locating the project where there are low or no biodiversity values.
- Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition.
- Locating ancillary facilities in areas: where there are no biodiversity values; where the native vegetation or threatened species habitat is in the poorest condition; and that avoid habitat for species and vegetation in high threat status categories.

In addition, potential indirect impacts will be minimised and mitigated during construction by the measures outlined in Section 3.3 and during occupation by the measures outlined in Section 3.1 and Section 3.3. These measures:

- control potential sedimentation of receiving waterways during construction;
- control noise, vibration, and dust spill during construction;
- control weed introduction and/or spread during construction; and
- control incidental damage of retained native vegetation and habitat during construction.

In combination, the above measures are considered sufficient to reduce the risk of indirect impacts to an acceptably low level. As such, the proposed development is unlikely to result in any indirect impacts on native vegetation or habitat.

### **3.2.3 Prescribed biodiversity impacts**

As described in Section 8.2 of the BAM, some types of 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. Clause 6.1 of the BC Regulation identifies the following as impacts that are 'prescribed biodiversity impacts' that must be assessed using the BOS.

*(a) impacts of development on the habitat of threatened species or ecological communities associated with:*

- (i) karst, caves, crevices, cliffs and other geological features of significance;*
- (ii) rocks;*
- (iii) human made structures;*
- (iv) non-native vegetation;*

*(b) impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range;*

*(c) impacts of development on movement of threatened species that maintains their life cycle;*

*(d) impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining);*

*(e) impacts of wind turbine strikes on protected animals; and*

*(f) impacts of vehicle strikes on threatened species or on animals that are part of a TEC.*

The subject land does not contain any of the above habitat features, nor does the proposed development have the potential to cause or contribute to any of the above listed prescribed biodiversity impacts. Accordingly, no potential 'prescribed biodiversity impacts' due to the proposed development were identified during the development of this BDAR.

### **3.3 Mitigation of Residual Impacts on Biodiversity Values**

The following mitigation techniques will be implemented to address the residual impacts on biodiversity values during and after the construction phase of the proposed development. In combination, these mitigation measures are considered sufficient to reduce the risk of residual impacts to an acceptably low level.

#### **3.3.1 Construction**

A Construction Environmental Management Plan (CEMP) will be developed to guide the proposed development from before construction commences and until construction is completed. At a minimum the CEMP will include:

- appropriate definition of clearing boundaries;
- clearing procedures;
- weed management procedures;
- sediment and erosion controls to prevent site run-off;
- noise, vibration, and dust control;
- flow controls;
- pollution and waste management;
- water treatment standards before release; and
- monitoring, reporting, and compliance requirements.

Best practice sediment and erosion control, such as the use of sediment traps, sediment interception ponds, silt fences and haybale fences, will be implemented as required during construction to minimise the flow of water and associated material into the surrounding areas and water sources.

The key potential risk to the biodiversity values of the subject land and adjoining areas during construction of the proposed development is the facilitated spread of the high threat weeds

currently occurring in the locality and/or the introduction of new weeds. Therefore, at a minimum, the following weed management measures will be implemented construction.

- High threat weeds (specifically Prickly Pear and Fireweed) will be removed from the subject land prior to construction.
- Appropriate vehicle hygiene will be maintained. Vehicles and machinery entering the subject land will be clean of weed seed or propagules.
- Only sterile materials such as hessian/jute or rice straw will be used for soil stabilisation or similar purposes.
- High threat weeds will be prevented from establishing on newly created road verges, landscaped areas, and other open space.

### 3.3.2 Occupation

Ongoing weed monitoring and management throughout the retained areas of Lot 23 DP1256090 will occur in accordance with Capital Ecology (2019c<sup>30</sup>). This includes intensive initial weed control combined with a detailed program of ongoing weed monitoring and control.

Any future landscaping for the proposed development (subdivision and creation of lots) in areas of the subject land outside of the newly created lots will use only local native plant species. Where practicable within open space areas, all strata will be re-established (i.e. groundcover, midstorey shrubs, and canopy trees) to create fauna habitat complexity. This will discourage urban adapted species and encourage small woodland birds to visit the subject land.

Owners of newly created lots will be encouraged to use local native plant species for landscaping, and to re-establish all strata where practicable (i.e. groundcover, midstorey shrubs, and canopy trees). This will create fauna habitat complexity which will discourage urban adapted species and encourage small woodland birds and other native fauna to visit or traverse the subject land.

### 3.3.3 Adaptive management for uncertain impacts

As per the BAM, an adaptive management strategy is required for impacts on biodiversity values that are infrequent or difficult to measure prior to commencement of the proposed development. Such impacts are referred to as uncertain impacts. If uncertain impacts are identified, the proponent must develop an adaptive management strategy.

The proposed development is unlikely to result in biodiversity impacts that are unforeseen or uncertain, especially given that:

- the subject land does not support karst, caves, crevices, cliffs and other geological features of significance;
- the proposed development does not include underground mining;
- the proposed development does not include wind turbines; and

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<sup>30</sup> Capital Ecology (2019c). *Lot 1 DP221236, Marulan, NSW. Weed Management Strategy*. June 2019. Prepared for Darraby Pty Ltd.

- the proposed development is unlikely to substantively increase the incidence of vehicle strikes.

As such, an adaptive management strategy is not required for the proposed development.

### 3.4 Serious and Irreversible Impacts

The guidance to assist a decisionmaker to determine a serious and irreversible impact (NSW Government 2019<sup>31</sup>) provides a list of threatened species and ecological communities which are likely to be the subject of serious and irreversible impacts (SAII). The potential for a project to impact these SAII entities must be assessed in the BDAR.

The study area does not support any threatened species or ecological communities which are listed as an SAII entity.

### 3.5 Legislative Requirements

#### 3.5.1 Commonwealth EPBC Act – Referral

The proposed development is unlikely to have a significant impact on an EPBC Act listed MNES given the subject land does not:

- support any EPBC Act listed ecological communities;
- support any EPBC Act listed flora species; or
- contain habitat of potential importance to EPBC Act listed threatened or migratory fauna species.

In light of the above, EPBC Act referral is unwarranted and is not recommended.

#### 3.5.2 NSW BC Act – Biodiversity Offset Requirements

The BAM Calculator is the tool for quantifying the offset requirements for a project, the output being expressed as ecosystem credits and species credits. The results of the BAM credit calculations completed for the proposed development are provided below and detailed in Appendix E.

##### 3.5.2.1 Biodiversity risk weighting

The biodiversity risk weighting is a tool used in the BOS to mitigate the risk in offsetting the loss of vegetation, threatened entities and/or their habitat. The biodiversity risk weighting does this by increasing the quantum of credits required at an impact site. The biodiversity risk weighting is derived from two components:

- sensitivity to loss – based on threat status under legislation or evidence-based information that suggests the entity is at an increased risk of loss; and
- sensitivity to potential gain – based on life history characteristics and ecological information for a species.

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<sup>31</sup> NSW Government (2019). *Guidance to assist a decision-maker to determine a serious and irreversible impact*. State of New South Wales and Department of Planning, Industry and Environment. <https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/local-government-and-other-decision-makers/serious-and-irreversible-impacts-of-development>



The subject land contains vegetation with a vegetation integrity score that requires offsetting for impacts on ecosystem credits. The subject land does not contain threatened species habitat that requires offsetting for impacts on species credits. The biodiversity risk weighting for the identified ecosystem credits is shown below.

- PCT3486 – Biodiversity risk rating of 1.75.

### 3.5.2.2 Ecosystem credit requirements

The results of the BAM ecosystem credit calculations completed for the proposed development are provided in Table 15. As shown in Table 15, PCT3486 Zone 1 is the only vegetation zone in the subject land that has a vegetation integrity score sufficient for its clearance to result in generation of ecosystem credits, as outlined in Section 9.2.1 of the BAM, these being vegetation zones that have a vegetation integrity score of:

- $\geq 15$ , where the PCT is representative of an EEC or a CEEC
- $\geq 17$ , where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community
- $\geq 20$ , where the PCT does not represent a TEC and is not associated with threatened species habitat.

PCT3486 is not representative of a TEC and the subject land is not considered to support threatened species habitat. As such, the vegetation integrity score for the vegetation zone must be greater than 20 for its clearance to generate an ecosystem credit obligation.

**Table 15. Ecosystem credit requirements.**

PCT & Vegetation Zone	Vegetation Integrity Score	Proposed Clearance Area (ha)	Credits Required
PCT3486 Zone 1	41.2	0.21	4
PCT3486 Zone 3	4.5	1.31	0
PCT3486 Zone 4	0	12.38	0

### 3.5.2.3 Species credit requirements

The subject land does not support habitat of potential significance to any species credit species. Accordingly, the proposed development does not generate a species credit obligation.

### 3.5.3 NSW Koala SEPP – Koala Habitat Protection Requirements

Regarding the application of 'Chapter 4 Koala habitat protection 2021' of the *Biodiversity and Conservation SEPP 2021* for the proposed development of the subject land, the following points are noted.

- The subject land is located within the Goulburn Mulwaree Local Government Area (LGA), which is an LGA to which Chapter 4 applies as listed in Schedule 2. This LGA is within the Central and Southern Tablelands Koala Management Area.
- The subject land is zoned R1 General Residential, RU6 – Transition, and RE1 – Public Recreation.
- There is no approved koala plan of management applying to subject land.

- The subject land has an area of greater than 1 hectare.

Based on the above assessment, the development control provisions of Chapter 4 apply to the proposed development. Therefore –

*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.*

With regard to the above, the following points are noted.

- The subject land is an agricultural block immediately adjoining Marulan township and adjacent to the Hume Highway.
- The subject land has been substantially modified by its current and past land use, which has led to extensive clearing of the native woody overstorey, midstorey, and shrubstorey across approximately 89% of the area.
- The subject land is likely to be functionally isolated from the areas of intact vegetation located over 7.5 km away within which a Koala has been recorded.

In summary, while the areas of intact vegetation located to the south-east of the subject land may support a Koala population, the subject land is likely to be functionally isolated from that potential habitat by highly degraded agricultural land, urban development, and the Hume Highway. Additionally, the subject land has undergone extensive historical vegetation clearance, is subject to ongoing disturbance, and does not contain substantial areas of habitat required to support a Koala population. As such, the subject land does not support habitat features of value to the Koala and is not considered to support occupied Koala habitat.

With regard to the above, the subject land is considered unlikely to constitute important or occupied Koala habitat now or in the future. Council can therefore be satisfied that the proposed development is unlikely to have any impact on Koalas or Koala habitat and may grant consent to the development application.

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- Land Zoning Map - Sheet LZN\_003C.

- Lot Size Map - Sheet LSZ\_003C.
- Terrestrial Biodiversity Map - Sheet BIO\_003.

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## Appendices

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## Appendix A. BAM Plot/Transect Scores

PCT code	Veg. Zone	Plot No.	Composition (species richness)					
			Tree	Shrub	Grass & grass like	Forb	Fern	Other
3486	1	1	7	2	5	6	0	0
	3	1	1	1	1	0	0	0
	4	1	0	0	0	0	0	0
		2	0	0	1	0	0	0
		3	0	0	1	0	0	0

PCT code	Veg. Zone	Plot No.	Structure (% cover)					
			Tree	Shrub	Grass & grass like	Forb	Fern	Other
3486	1	1	43.1	0.3	20	1	0	0
	3	1	10	0.1	1	0	0	0
	4	1	0	0	0	0	0	0
		2	0	0	0.1	0	0	0
		3	0	0	0.1	0	0	0

PCT code	Veg. Zone	Plot No.	Function										
			Stem classes					No. of large trees	Hollow bearing trees	% Litter cover	Coarse woody debris (m)	% High threat weed cover	
			Regen.	5-9	10-19	20-29	30-49						
3486	1	1	1	1	1	1	1	0	0	0	1	3.6	
	3	1	0	0	0	0	1	1	0	1	1	1.8	
	4	1	0	0	0	0	0	0	0	0	0	0	1
		2	0	0	0	0	0	0	0	0	0	0	1
		3	0	0	0	0	0	0	0	0	0	0	0.4

## Appendix B. Flora Species Recorded by Plot and Percent Cover

Species List	Common Name	3486.1.1	3486.3.1	3486.4.1	3486.4.2	3486.4.3	Subject land	Study area
<b>Exotic</b>								
<i>Aira sp.</i>	Hair-grass							x
<i>Briza maxima</i>	Greater Quaking-grass	0.2					x	x
<i>Bromus sp.</i>	Brome Grass							x
<i>Capsella bursa-pastoris</i>	Shepherd's Purse	5.0	5.0				x	x
<i>Centaurium sp.</i>	Common Centaury							x
<i>Cirsium vulgare</i>	Spear Thistle			0.1	0.1	0.1	x	x
<i>Conyza sp.</i>	Fleabane	0.2		10.0	5.0	0.1	x	x
<i>Cyperus eragrostis</i>	Tall Flat-sedge	0.3				0.1	x	x
<i>Dactylis glomerata</i>	Cock's Foot	1.0		5.0			x	x
<i>Ehrharta erecta</i>	Panic Veldtgrass	5.0					x	x
<i>Eleusine tristachya</i>	Goose Grass		5.0		1.0	2.0	x	x
<i>Eragrostis curvula</i>	African Lovegrass	0.2					x	x
<i>Gnaphalium americanum</i>	Purple Cudweed	0.5		1.0	0.3		x	x
<i>Hordeum sp.</i>	Barley Grass		5.0				x	x
<i>Hypochaeris glabra</i>	Smooth Cats-ear		2.0				x	x
<i>Hypochaeris radicata</i>	Flatweed		5.0	2.0	5.0	2.0	x	x
<i>Lactuca serriola</i>	Prickly Lettuce							x
<i>Lepidium africanum</i>	Common Peppergrass		0.1				x	x
<i>Lolium perenne</i>	Perennial Ryegrass		25.0	5.0	3.0	10.0	x	x
<i>Modiola caroliniana</i>	Red-flowered Mallow			0.2	0.2		x	x
<i>Nassella trichotoma</i>	Serrated Tussock		0.2				x	x
<i>Opuntia sp.</i>	Prickly Pear						x	x
<i>Paronychia brasiliensis</i>	Brazilian Whitlow							x
<i>Phalaris aquatica</i>	Phalaris		10.0				x	x
<i>Plantago lanceolata</i>	Plantain / Lamb's Tongue	2.0	2.0	1.0	2.0	0.2	x	x
<i>Polygonum aviculare</i>	Wireweed							x
<i>Rubus fruticosus</i>	Blackberry	0.2			0.2		x	x
<i>Rumex acetosella</i>	Sheep's Sorrel		8.0	1.0	1.0	2.0	x	x
<i>Secale cereale</i>	Cereal Rye							x
<i>Senecio madagascariensis</i>	Fireweed					0.1	x	x
<i>Setaria parviflora</i>	Slender Pigeon Grass			5.0	5.0	2.0	x	x
<i>Solanum linnaeanum</i>	Apple of Sodom							x
<i>Solanum nigrum</i>	Black Nightshade	0.2					x	x
<i>Spergularia rubra</i>	Red Sandspurry							x
<i>Trifolium sp.</i>	Clover			3.0	3.0	1.0	x	x
<i>Vicia sp.</i>	Vetch							x
<i>Vulpia sp.</i>	Rat's Tail Fescue	2.0		5.0	10.0	30.0	x	x

Species List	Common Name	3486.1.1	3486.3.1	3486.4.1	3486.4.2	3486.4.3	Subject land	Study area
<b>Native</b>								
<i>Acacia decurrens</i>	Early Black Wattle	3.0					x	x
<i>Allocasuarina littoralis</i>	Black She-oak	3.0					x	x
<i>Aristida ramosa</i>	Purple Wiregrass							x
<i>Astroloma humifusum</i>	Native Cranberry							x
<i>Austrostipa bigeniculata</i>	Tall Speargrass	10.0	1.0				x	x
<i>Austrostipa scabra</i>	Rough Spear-grass							x
<i>Bossiaea buxifolia</i>	Matted Bossiaea							x
<i>Bothriochloa macra</i>	Red-leg Grass							x
<i>Brachyloma daphnoides</i>	Daphne Heath							x
<i>Cassinia aculeata</i>	Common Cassinia		0.1				x	x
<i>Cheilanthes sieberi</i>	Rock Fern							x
<i>Chrysocephalum apiculatum</i>	Common Everlasting							x
<i>Crassula sieberiana</i>	Austral Stonecrop							x
<i>Cymbonotus lawsonianus</i>	Bear's Ears	0.3					x	x
<i>Dianella revoluta</i>	Blue Flax-Lily	0.2					x	
<i>Dichelachne crinita</i>	Long-hair Plume Grass							x
<i>Einadia nutans</i>	Climbing Saltbush							x
<i>Eucalyptus agglomerata</i>	Blue-leaved Stringybark							x
<i>Eucalyptus amplifolia</i>	Cabbage Gum	0.1					x	x
<i>Eucalyptus bridgesiana</i>	Apple Box	20.0					x	x
<i>Eucalyptus cinerea</i>	Argyle Apple	10.0					x	x
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark	2.0	10.0				x	x
<i>Eucalyptus melliodora</i>	Yellow Box	5.0					x	x
<i>Euchiton sp.</i>	Cudweed							x
<i>Gonocarpus tetragynus</i>	Common Raspwort	0.1					x	x
<i>Goodenia hederacea</i>	Ivy Goodenia							x
<i>Hovea heterophylla</i>	Common Hovea	0.1					x	x
<i>Hypericum gramineum</i>	Native St John's Wort							x
<i>Juncus australis</i>	Austral Rush				0.1	0.1	x	x
<i>Kunzea parvifolia</i>	Violet kunzea	0.2					x	x
<i>Leucochrysum albicans</i>	Hoary Sunray							x
<i>Lissanthe strigosa</i>	Peach Heath	0.1					x	x
<i>Lomandra coriacea</i>	Wattle Mat-rush							x
<i>Lomandra filiformis subsp. coriacea</i>	Wattle Mat-rush	1.0					x	x
<i>Lomandra multiflora</i>	Many-flowered Mat-rush	3.0					x	x
<i>Melichrus urceolatus</i>	Urn Heath							x
<i>Microlaena stipoides</i>	Weeping Grass	5.0					x	x
<i>Oxalis perennans</i>	Woody-Root Oxalis							x
<i>Panicum effusum</i>	Hairy Panic							x



Species List	Common Name	3486.1.1	3486.3.1	3486.4.1	3486.4.2	3486.4.3	Subject land	Study area
<i>Rytidosperma sp.</i>	Wallaby Grass							x
<i>Senecio quadridentatus</i>	Cotton Fireweed	0.1					x	x
<i>Themeda triandra</i>	Kangaroo Grass	1.0					x	x
<i>Wahlenbergia communis</i>	Native Bluebell							x
<i>Wahlenbergia gracilis</i>	Sprawling / Common Bluebell							x
<i>Wahlenbergia luteola</i>	Yellowish Bluebell							x
<b>Number of Species</b>		31	14	12	14	13	48	82 (77)
<b>Number of Native Species</b>		19	3	0	1	1	21	45 (42)
<b>Number of Native Non-grass Species</b>		8	1	0	0	0	9	30
<b>Number of Exotic Species</b>		12	11	12	13	12	27	37
<b>% Perennial Native Ground Cover</b>		20.8	1.0	0.0	0.1	0.1	-	-

## Appendix C. Tree Habitat Assessment Results

Tree number	Species Name	Common Name	DBH (cm)	Height (m)	Hollows			Alive/Dead	Notes
					S	M	L		
1	<i>E. eugenioides</i>	Thin-leaved Stringybark	90	12	2			A	
2	<i>E. eugenioides</i>	Thin-leaved Stringybark	55	10	6			A	
3	<i>E. rubida</i>	Candlebark	55	15	1			A	
4	<i>E. eugenioides</i>	Thin-leaved Stringybark	36	10	3			A	
5	<i>E. amplifolia</i>	Cabbage Gum	63	15	2			A	
6	<i>E. eugenioides</i>	Thin-leaved Stringybark	38	10		1		A	

## Appendix D. Fauna Species Recorded

Classification	Scientific Name	Common Name	BC Act	EPBC Act
Amphibia	<i>Litoria peronii</i>	Peron's Tree Frog	Protected	-
Aves	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	Protected	-
Aves	<i>Acridotheres tristis</i>	Indian Myna	-	-
Aves	<i>Artamus superciliosus</i>	White-browed Woodswallow	Protected	-
Aves	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	Protected	-
Aves	<i>Falco berigora</i>	Brown Falcon	Protected	-
Aves	<i>Grallina cyanoleuca</i>	Magpie-lark	Protected	-
Aves	<i>Gymnorhina tibicen</i>	Australian Magpie	Protected	-
Aves	<i>Lalage sueurii</i>	White-winged Triller	Protected	-
Aves	<i>Manorina melanocephala</i>	Noisy Miner	Protected	-
Aves	<i>Ocyphaps lophotes</i>	Crested Pigeon	Protected	-
Aves	<i>Petrochelidon nigricans</i>	Tree Martin	Protected	-
Aves	<i>Psephotus haematonotus</i>	Red-rumped Parrot	Protected	-
Aves	<i>Rhipidura leucophrys</i>	Willy Wagtail	Protected	-
Aves	<i>Sturnus vulgaris</i>	Common Starling	-	-
Mammalia	-	Microbat	Protected	-
Mammalia	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	Protected	-
Mammalia	<i>Oryctolagus cuniculus</i>	European Rabbit	-	-
Mammalia	<i>Trichosurus vulpecula</i>	Common Brushtail Possum	Protected	-
Mammalia	<i>Vulpes vulpes</i>	Red Fox	-	-

## Appendix E. BAM Credit Summary Report

## Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00034550/BAAS17089/22/00034551	3148 - Marulan Stage 3 - BDAR	22/06/2023
Assessor Name	Report Created	BAM Data version *
Robert Speirs	12/12/2023	61
Assessor Number	Assessment Type	BAM Case Status
BAAS17089	Part 4 Developments (General)	Finalised
Assessment Revision	Date Finalised	BOS entry trigger
2	12/12/2023	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.

## Vegetation Zones

#	Name	PCT	Condition	Area	Minimum number of plots	Management zones
1	3486_1	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest	1	0.21	1	



## BAM Vegetation Zones Report

2	3486_3	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest	3	1.31	1	
3	3486_4	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest	4	12.38	3	

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00034550/BAAS17089/22/00034551	3148 - Marulan Stage 3 - BDAR	22/06/2023
Assessor Name	Report Created	BAM Data version *
Robert Speirs	12/12/2023	61
Assessor Number	Assessment Type	BAM Case Status
BAAS17089	Part 4 Developments (General)	Finalised
Assessment Revision	BOS entry trigger	Date Finalised
2	BOS Threshold: Area clearing threshold	12/12/2023

\* 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.

**Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.**

Common Name	Scientific Name	Vegetation Types(s)
Barking Owl	<i>Ninox connivens</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Black Falcon	<i>Falco subniger</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Diamond Firetail	<i>Stagonopleura guttata</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Dusky Woodswallow	<i>Artamus cyanopterus cyanopterus</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Flame Robin	<i>Petroica phoenicea</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest

## BAM Predicted Species Report

Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Little Eagle	<i>Hieraetus morphnoides</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Little Lorikeet	<i>Glossopsitta pusilla</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Masked Owl	<i>Tyto novaehollandiae</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Painted Honeyeater	<i>Grantiella picta</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Powerful Owl	<i>Ninox strenua</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Regent Honeyeater	<i>Anthochaera phrygia</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Rosenberg's Goanna	<i>Varanus rosenbergi</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Scarlet Robin	<i>Petroica boodang</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Speckled Warbler	<i>Chthonicola sagittata</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Swift Parrot	<i>Lathamus discolor</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Turquoise Parrot	<i>Neophema pulchella</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Varied Sittella	<i>Daphoenositta chrysoptera</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
White-throated Needletail	<i>Hirundapus caudacutus</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest
Yellow-bellied Glider	<i>Petaurus australis</i>	3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest

### Threatened species Manually Added

None added

### Threatened species assessed as not within the vegetation zone(s) for the PCT(s)

Refer to BAR for detailed justification

Common Name	Scientific Name	Justification in the BAM-C
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## Proposal Details

Assessment Id 00034550/BAAS17089/22/00034551	Proposal Name 3148 - Marulan Stage 3 - BDAR	BAM data last updated * 22/06/2023
Assessor Name Robert Speirs	Report Created 12/12/2023	BAM Data version * 61
Assessor Number BAAS17089	Assessment Type Part 4 Developments (General)	BAM Case Status Finalised
Assessment Revision 2	Date Finalised 12/12/2023	BOS entry trigger BOS Threshold: Area clearing threshold

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

## List of Species Requiring Survey

Name	Presence	Survey Months
<b><i>Haliaeetus leucogaster</i></b> White-bellied Sea-Eagle	No (surveyed)	<input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input type="checkbox"/> May <input type="checkbox"/> Jun <input checked="" type="checkbox"/> Jul <input type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input checked="" type="checkbox"/> Nov <input checked="" type="checkbox"/> Dec <input type="checkbox"/> Survey month outside the specified months?
<b><i>Hieraaetus morphnoides</i></b> Little Eagle	No (surveyed) *Survey months are outside of the months specified in Bionet.	<input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input type="checkbox"/> May <input type="checkbox"/> Jun <input type="checkbox"/> Jul <input type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input checked="" type="checkbox"/> Nov <input checked="" type="checkbox"/> Dec <input checked="" type="checkbox"/> Survey month outside the specified months?
<b><i>Leucochrysum albicans subsp. tricolor</i></b> Hoary Sunray	No (surveyed)	<input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr <input type="checkbox"/> May <input type="checkbox"/> Jun <input type="checkbox"/> Jul <input type="checkbox"/> Aug <input type="checkbox"/> Sep <input type="checkbox"/> Oct <input type="checkbox"/> Nov <input checked="" type="checkbox"/> Dec <input type="checkbox"/> Survey month outside the specified months?

## BAM Candidate Species Report

<p><b><i>Pomaderris cotoneaster</i></b> Cotoneaster Pomaderris</p>	<p>No (surveyed) *Survey months are outside of the months specified in Bionet.</p>	<p> <input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr  <input type="checkbox"/> May <input type="checkbox"/> Jun <input type="checkbox"/> Jul <input type="checkbox"/> Aug  <input type="checkbox"/> Sep <input checked="" type="checkbox"/> Oct <input checked="" type="checkbox"/> Nov <input checked="" type="checkbox"/> Dec         </p> <p><input checked="" type="checkbox"/> Survey month outside the specified months?</p>
<p><b><i>Pteropus poliocephalus</i></b> Grey-headed Flying-fox</p>	<p>No (surveyed)</p>	<p> <input type="checkbox"/> Jan <input type="checkbox"/> Feb <input type="checkbox"/> Mar <input type="checkbox"/> Apr  <input type="checkbox"/> May <input type="checkbox"/> Jun <input type="checkbox"/> Jul <input type="checkbox"/> Aug  <input type="checkbox"/> Sep <input checked="" type="checkbox"/> Oct <input checked="" type="checkbox"/> Nov <input checked="" type="checkbox"/> Dec         </p> <p><input type="checkbox"/> Survey month outside the specified months?</p>

### Threatened species Manually Added

None added

### Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Barking Owl	<i>Ninox connivens</i>	Habitat constraints
Booroolong Frog	<i>Litoria booroolongensis</i>	Refer to BAR
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	Refer to BAR
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	Habitat constraints
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	Habitat degraded
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	Habitat constraints
Giant Burrowing Frog	<i>Heleioporus australiacus</i>	Refer to BAR
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	Habitat constraints
Koala	<i>Phascolarctos cinereus</i>	Habitat constraints
Large Bent-winged Bat	<i>Miniopterus orianae oceanensis</i>	Habitat constraints
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	Habitat constraints
Masked Owl	<i>Tyto novaehollandiae</i>	Habitat constraints
Matted Bush-pea	<i>Pultenaea pedunculata</i>	Refer to BAR

## BAM Candidate Species Report

Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	Habitat degraded Habitat constraints
Powerful Owl	<i>Ninox strenua</i>	Habitat constraints
Regent Honeyeater	<i>Anthochaera phrygia</i>	Refer to BAR
<i>Solanum armourense</i>	<i>Solanum armourense</i>	Refer to BAR
Southern Brown Bandicoot (eastern)	<i>Isoodon obesulus obesulus</i>	Habitat degraded Habitat constraints
Southern Greater Glider	<i>Petauroides volans</i>	Habitat degraded
Southern Myotis	<i>Myotis macropus</i>	Habitat constraints
Squirrel Glider	<i>Petaurus norfolcensis</i>	Habitat degraded
Stuttering Frog	<i>Mixophyes balbus</i>	Refer to BAR
Swift Parrot	<i>Lathamus discolor</i>	Habitat constraints



# BAM Biodiversity Credit Report (Like for like)

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00034550/BAAS17089/22/00034551	3148 - Marulan Stage 3 - BDAR	22/06/2023
Assessor Name	Assessor Number	BAM Data version *
Robert Speirs	BAAS17089	61
Proponent Names	Report Created	BAM Case Status
	12/12/2023	Finalised
Assessment Revision	Assessment Type	Date Finalised
2	Part 4 Developments (General)	12/12/2023
BOS entry trigger	* 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.	
BOS Threshold: Area clearing threshold		

## Potential Serious and Irreversible Impacts

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

## Additional Information for Approval

Assessment Id	Proposal Name
00034550/BAAS17089/22/00034551	3148 - Marulan Stage 3 - BDAR



# BAM Biodiversity Credit Report (Like for like)

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT

No Changes

Predicted Threatened Species Not On Site

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest	Not a TEC	13.9	4	0	4

3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region



## BAM Biodiversity Credit Report (Like for like)

<p>Central Gorge Dry Sclerophyll Forests This includes PCT's: 3486</p>	<p>Central Gorge Dry Sclerophyll Forests &gt;=50% and &lt;70%</p>	<p>3486_1</p>	<p>Yes</p>	<p>4 Bungonia, Bateman, Burragorang, Crookwell, Ettrema, Kanangra, Kybeyan-Gourock, Monaro and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
<p>Central Gorge Dry Sclerophyll Forests This includes PCT's: 3486</p>	<p>Central Gorge Dry Sclerophyll Forests &gt;=50% and &lt;70%</p>	<p>3486_3</p>	<p>Yes</p>	<p>0 Bungonia, Bateman, Burragorang, Crookwell, Ettrema, Kanangra, Kybeyan-Gourock, Monaro and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>
<p>Central Gorge Dry Sclerophyll Forests This includes PCT's: 3486</p>	<p>Central Gorge Dry Sclerophyll Forests &gt;=50% and &lt;70%</p>	<p>3486_4</p>	<p>No</p>	<p>0 Bungonia, Bateman, Burragorang, Crookwell, Ettrema, Kanangra, Kybeyan-Gourock, Monaro and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.</p>



# BAM Biodiversity Credit Report (Like for like)

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## Species Credit Summary

No Species Credit Data

## Credit Retirement Options

Like-for-like credit retirement options



# BAM Biodiversity Credit Report (Variations)

## Proposal Details

<b>Assessment Id</b> 00034550/BAAS17089/22/00034551	<b>Proposal Name</b> 3148 - Marulan Stage 3 - BDAR	<b>BAM data last updated *</b> 22/06/2023
<b>Assessor Name</b> Robert Speirs	<b>Assessor Number</b> BAAS17089	<b>BAM Data version *</b> 61
<b>Proponent Name(s)</b>	<b>Report Created</b> 12/12/2023	<b>BAM Case Status</b> Finalised
<b>Assessment Revision</b> 2	<b>Assessment Type</b> Part 4 Developments (General)	<b>Date Finalised</b> 12/12/2023
<b>BOS entry trigger</b> BOS Threshold: Area clearing threshold	<b>* Disclaimer:</b> BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.	

## Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
<b>Nil</b>		
<b>Species</b>		
<b>Nil</b>		

## Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks



# BAM Biodiversity Credit Report (Variations)

PCT

No Changes

Predicted Threatened Species Not On Site

Name

No Changes

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

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest	Not a TEC	13.9	4	0	4.00

3486-Wollondilly-Shoalhaven Slopes Grassy Open Forest	Like-for-like credit retirement options					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Central Gorge Dry Sclerophyll Forests This includes PCT's: 3486	Central Gorge Dry Sclerophyll Forests >=50% and <70%	3486_1	Yes	4	Bungonia, Bateman, Burragorang, Crookwell, Ettrema, Kanangra, Kybeyan-Gourock, Monaro and South East Coastal Ranges.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

## BAM Biodiversity Credit Report (Variations)

Central Gorge Dry Sclerophyll Forests This includes PCT's: 3486	Central Gorge Dry Sclerophyll Forests >=50% and <70%	3486_3	Yes	0	Bungonia,Bateman, Burragorang, Crookwell, Ettrema, Kanangra, Kybeyan-Gourock, Monaro and South East Coastal Ranges.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Central Gorge Dry Sclerophyll Forests This includes PCT's: 3486	Central Gorge Dry Sclerophyll Forests >=50% and <70%	3486_4	No	0	Bungonia,Bateman, Burragorang, Crookwell, Ettrema, Kanangra, Kybeyan-Gourock, Monaro and South East Coastal Ranges.  or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
<b>Variation options</b>					
Formation	Trading group	Zone	HBT	Credits	IBRA region
Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 3 or higher threat status	3486_1	Yes (including artificial)	4	IBRA Region: South Eastern Highlands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 3 or higher threat status	3486_3	Yes (including artificial)	0	IBRA Region: South Eastern Highlands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.



## BAM Biodiversity Credit Report (Variations)

	Dry Sclerophyll Forests (Shrub/grass sub-formation)	Tier 3 or higher threat status	3486_4	No	0	IBRA Region: South Eastern Highlands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
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### Species Credit Summary

No Species Credit Data

### Credit Retirement Options    Like-for-like options

## Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00034550/BAAS17089/22/00034551	3148 - Marulan Stage 3 - BDAR	22/06/2023
Assessor Name	Report Created	BAM Data version *
Robert Speirs	12/12/2023	61
Assessor Number	BAM Case Status	Date Finalised
BAAS17089	Finalised	12/12/2023
Assessment Revision	Assessment Type	BOS entry trigger
2	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

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## 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 SAI	Ecosystem credits
<b>Wollondilly-Shoalhaven Slopes Grassy Open Forest</b>												
1	3486_1	Not a TEC	41.2	41.2	0.21	PCT Cleared - 60%	High Sensitivity to Gain			1.75		4

## BAM Credit Summary Report

2	3486_3	Not a TEC	4.5	4.5	1.3	PCT Cleared - 60%	High Sensitivity to Gain			1.75		0
3	3486_4	Not a TEC	0	0.0	12.4	PCT Cleared - 60%	High Sensitivity to Gain			1.75		0
										<b>Subtotal</b>		<b>4</b>
										<b>Total</b>		<b>4</b>

### 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 SAll	Species credits