Subdivision of Jumping Creek Estate, Queanbeyan, NSW

Biodiversity Development Assessment Report

Final Version 3.1 - June 2021
Prepared for: Prepared for Peet Jumping Creek Pty Ltd

Document Information

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- Giselle Ravarian, Principal Urban Designer & Planner, Spacelab Pty Ltd

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

Peet Limited is currently progressing with the planning and approval process to develop Jumping Creek Estate within portions of Lot 1 DP1249543 (formerly Lot 5 DP1199045), Queanbeyan, NSW (the 'proposed development' of the 'subject land'). Capital Ecology Pty Ltd (Capital Ecology) has been commissioned by Peet Jumping Creek Pty Ltd 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 subject land.

Scope

As a development application (DA), informed by previous versions of this BDAR, was lodged for the proposed development in May 2019 (DA 109-2019), this BDAR has been developed pursuant BAM 2017.

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).

The proposed development was the subject of a Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral (EPBC Act Ref:2019/8486) (the referral being informed by a previous version of this BDAR [Capital Ecology 2019]). The decision of the referral was that the proposed action (i.e. the proposed development) is **not a controlled action**. Therefore, this BDAR does not include any further assessment of the potential impacts of the proposed development on Matters of National Environmental Significance (MNES) listed pursuant to the EPBC Act.

Survey overview

The following ecological surveys were performed by Capital Ecology between 31 July 2018 and 28 January 2020.

- a biodiversity assessment;
- a tree habitat assessment;
- a threatened flora and threatened bird survey;
- a fauna nesting survey;
- a stag-watching survey;
- a threatened nocturnal fauna survey;
- a rock turning survey; and
- a threatened bat survey.

Vegetation and potential flora/fauna habitat were surveyed and mapped in accordance with the BAM, this included:

- assessment of each tree for the presence of functional hollows and/or large stick nests;

- threatened flora and threatened bird surveys via transect surveys, random meanders through likely habitat, and via opportunistic observations;
- inspections of each tree for signs of fauna breeding in hollows or large stick nests;
- nocturnal stag-watching surveys of selected trees for signs of nocturnal fauna breeding in hollows;
- threatened nocturnal fauna surveys via random meanders through likely habitat;
- surveys for threatened reptiles via a rock turning survey consistent with the Commonwealth guidelines; and
- Anabat® surveys for threatened bats.

Results

Native vegetation

The subject land supports two Plant Community Types (PCTs).

- PCT1093 – Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion.
- PCT1334 – Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion.

The whole of the subject land and the majority of the study area has been utilised over an extended period for various purposes, including mining, quarrying and grazing/agriculture. As a result, approximately 73% of the study area (rising to approximately 89% when the subject land is considered in isolation) has been cleared and the majority of the vegetation which remains is highly modified and dominated by exotic species such as Tree of Heaven, Willow, Blackberry, Hawthorn, St John's Wort, and Paterson's Curse. There are some stands of relatively intact native vegetation in the study area. These areas occur along sections of the riparian corridors, the higher elevated portions of the study area, and the south-eastern boundary of the study area.

Threatened ecological communities

PCT1334 is identified as the potential BC Act listed threatened ecological community (TEC) *White Box Yellow Box Blakely's Red Gum Woodland*. This community is commonly referred to as Box-Gum Woodland. Assessments of structure and floristic composition determined that the vegetation zones PCT1334 Zone 1 and Zone 2 meet the listing criteria for the BC Act listed TEC.

Threatened species

The historic activities which have occurred across much of the subject land have substantially degraded the habitat value for flora and fauna. As a result, no threatened flora or fauna species were recorded within the subject land. Due to the low number of hollow bearing trees, the subject land is unlikely to be of value as breeding or nesting habitat for threatened birds.

While no threatened species were recorded within the subject land, the areas of more intact vegetation (i.e. PCT1093 Zone 1 and PCT1334 Zone 1) do provide potential foraging habitat for a variety of threatened fauna, particularly threatened birds and threatened bats. This is especially true across the wider study area where substantial patches of intact vegetation are present. Five threatened fauna species were recorded in the wider study area, specifically Dusky Woodswallow

Artamus cyanopterus (BC Act vulnerable), Scarlet Robin *Petroica boodang* (BC Act vulnerable), Diamond Firetail *Stagonopleura guttata* (BC Act vulnerable), Eastern False Pipistrelle *Falsistrellus tasmaniensis* (BC Act vulnerable), and Large Bent-winged Bat *Miniopterus orianae aceanensis* (BC Act vulnerable). None of these species were observed breeding in the subject land.

Despite substantial survey effort, no threatened flora species, threatened nocturnal fauna species, or Pink-tail Legless Lizard were recorded in the subject land or study area.

Impacts

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

- 1.48 ha of PCT1093 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation);
- 2.93 ha of PCT1093 Zone 2 – Moderate to high diversity vegetation which lacks an overstorey (BC Act native vegetation);
- 0.85 ha of PCT1334 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation, EPBC Act and BC Act Box-Gum Woodland);
- 1.98 ha of PCT1334 Zone 2 – Native overstorey with a low diversity exotic groundlayer (BC Act native vegetation, BC Act Box-Gum Woodland);
- four hollow bearing trees; and
- one termite mound.

In total, the proposed development will result in the clearance of 7.24 ha of BC Act native vegetation, 2.83 ha of which meets the listing criteria for BC Act Box-Gum Woodland.

The proposed development will not result in any other direct impacts on native vegetation or habitat.

As outlined below, the subject land contains vegetation with a vegetation integrity score that requires offsetting for impacts on ecosystem credits, including vegetation which meets the definition of a TEC (i.e. PCT1334 Zone 1 and Zone 2).

- PCT1093 Zone 1 – vegetation integrity score of 47.6, proposed clearance of 1.48 ha.
- PCT1334 Zone 1 – vegetation integrity score of 48.7, proposed clearance of 0.85 ha.
- PCT1334 Zone 2 – vegetation integrity score of 31.2, proposed clearance of 1.98 ha.

The subject land supports PCT1334, an ecological community which is listed as a serious and irreversible impacts (SAII) entity. Accordingly, the proposed development could result in a SAII on a BC Act listed entity. However, the proposed removal of 2.83 ha of BC Act listed Box-Gum Woodland is unlikely to constitute an SAII as the impact is small and on vegetation that is already fragmented and partially degraded.

The proposed development will not impact any species credit species.

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

Assessment and Approval Requirements

Commonwealth EPBC Act requirements

As mentioned previously, the proposed development was the subject of an EPBC Act referral (EPBC Act Ref:2019/8486) (the referral being informed by the previous version of this BDAR [Capital Ecology 2019]). The decision of the referral was that the proposed action (i.e. the proposed development) is **not a controlled action**.

NSW BC Act biodiversity offset credit requirements

The proposed development will involve the clearance of three vegetation zones and generate the following ecosystem credits.

- PCT1093 Zone 1 – clearance of 1.48 ha which generates 31 ecosystem credits.
- PCT1334 Zone 1 – clearance of 0.85 ha which generates 26 ecosystem credits.
- PCT1334 Zone 2 – clearance of 1.98 ha which generates 39 ecosystem credits.

This vegetation clearance will generate an estimated ecosystem credit obligation of $468,807.25 (incl. GST). This estimate is based on the baseline credit price for the relevant entities on 29 June 2021.

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

Regarding the application of the *State Environmental Planning Policy (Koala Habitat Protection) 2021* (the 'Koala Habitat Protection SEPP') for the proposed development of the subject land, the following points are noted.

1. The subject land is located within the Queanbeyan-Palerang Regional Local Government Area (LGA), which is an LGA to which he Koala Habitat Protection SEPP applies as listed in Schedule 1.

2. The subject land and wider study area have an area of greater than 1 hectare.

3. The subject land and wider study area support tree species listed in Schedule 2 of the Koala Habitat Protection SEPP. Accordingly, the subject land supports 'potential koala habitat'.

4. Over the past 18 years, BioNet records four Koala sightings within 2.5 km of the subject land (recorded in 2007, 2016, 2018, and 2019). These Koala records occur in well-timbred vegetation to the north and north-east of the subject land.

   However, approximately 89% of the subject land has been historically cleared. As a result, the remaining vegetation is largely isolated and fragmented and the midstorey and shrubstorey are largely absent. In addition, despite being conspicuous when present, no Koalas or signs of Koala presence were detected during the tree habitat assessment, fauna nesting survey, multiple other surveys (e.g. plot/transects, threatened flora and bird surveys, threatened nocturnal fauna surveys), or by previous targeted surveys (EcoLogical Australia 2010). The degraded vegetation and lack of Koala observations indicates that the subject land should not be classified as 'highly suitable habitat' or 'core Koala habitat'.

With regard to the above and with respect to the Koala Habitat Protection SEPP, the subject land and wider study area are therefore considered unlikely to constitute ‘highly suitable habitat’ or ‘core Koala habitat’.

1 Introduction

Peet Limited is currently progressing with the planning and approval process to develop Jumping Creek Estate within portions of Lot 1 DP1249543 (formerly Lot 5 DP1199045), Queanbeyan, NSW (the 'proposed development' of the 'subject land'). Capital Ecology Pty Ltd (Capital Ecology) has been commissioned by Peet Jumping Creek Pty Ltd 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 subject land.

As a development application (DA), informed by previous versions of this BDAR (Capital Ecology 2019[1], 2020[2]), was lodged for the proposed development in May 2019 (DA 109-2019), this BDAR has been developed pursuant BAM 2017 (NSW Government 2017a[3]). 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 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).

The proposed development was the subject of a Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral (EPBC Act Ref:2019/8486) (the referral being informed by a previous version of this BDAR [Capital Ecology 2019]). The decision of the referral was that the proposed action (i.e. the proposed development) is **not a controlled action**. Therefore, this BDAR does not include any further assessment of the potential impacts of the proposed development on Matters of National Environmental Significance (MNES) listed pursuant to the EPBC Act.

1.1 Study Area and Subject Land

The 'study area' for this BDAR, encompassing a total area of 94.53 ha, includes the entirety of Lot 1 DP1249543 (formerly Lot 5 DP1199045), Queanbeyan, NSW (Figure 1 to Figure 3).

The 'subject land' for this BDAR relates only to the portions of the study area that will be impacted by the proposed development (Figure 2 and Figure 3). The subject land encompasses a total area of 40.64 ha, which equates to approximately 43% of the subject land.

The study area, as shown in Figure 1, is bordered by:

- land zoned for environmental conservation/management to the north, east and south;
- the Queanbeyan River to the west, beyond which is the suburb of Karabar; and
- Ellerton Drive to the north-west, beyond which is the suburb of Greenleigh.

[1] Capital Ecology (2019). *Subdivision of Jumping Creek Estate, Queanbeyan, NSW – Biodiversity Development Assessment Report.* Final – March 2019. Prepared for Peet Limited and Spacelab Pty Ltd. Authors: R. Speirs & S. Reid. Project no. 2794.

[2] Capital Ecology (2020). *Subdivision of Jumping Creek Estate, Queanbeyan, NSW – Biodiversity Development Assessment Report*. Final v2.1 – March 2020. Prepared for Peet Jumping Creek Pty Ltd. Authors: R. Speirs & S. Reid. Project no. 2794.

[3] NSW Government (2017a). *Biodiversity Assessment Method*. NSW Office of Environment and Heritage. Published LW 25 August 2017.

Valley Creek (also known as Jumping Creek) runs from the south-east to the center of the study area where, before draining into the Queanbeyan River approximately 500 m to the south-west, it is joined by an unnamed creek which enters from the north of the study area.

Located in the Queanbeyan-Palerang Regional Council Local Government Area (LGA), pursuant to the *Queanbeyan Local Environmental Plan 2012* (Queanbeyan LEP), the study area is composed of the following land zones[4]:

- E2 – Environmental Conservation;
- E4 – Environmental Living; and
- RE1 – Public Recreation.

Parts of the study area are identified on the Queanbeyan LEP Terrestrial Biodiversity Map[5]. The identified areas correspond to those which retain a woody overstorey or which form part of the river or creek corridors.

The elevation across the study area ranges from approximately 565 m Australian Height Datum (AHD) along the Queanbeyan River to 685 m AHD on the hill in the north-east of the study area. The topography varies substantially across the study area, falling sharply around Valley Creek, the unnamed creek, and their associated tributaries.

There is no built infrastructure in the study area, but the Ellerton Drive Extension, which boarders the north-west of the study area, has recently been constructed.

The study area has been heavily modified by its history of varying land uses, including mining, quarrying, and grazing/agriculture. More recently, the study area has been impacted by additional human activities (e.g. off-road vehicles and rubbish dumping) and by ongoing key threatening processes (e.g. invasive plants and animals). These historic activities and ongoing impacts have substantially degraded the ecological values of the study area to the point where it is now largely dominated by exotic plants. The existing access tracks and stock fences are in a poor condition.

EcoLogical Australia (2010[6]) performed a Flora and Fauna Assessment of the study area for a rezoning proposal. This included (but was not limited to) targeted threatened flora surveys, tree hollow surveys, dusk stag-watch surveys for nocturnal mammals and birds, spotlight surveys, playback surveys for nocturnal mammals and birds, Anabat® surveys, bird surveys, rock turning surveys, and Golden Sun Moth *Synemon plana* surveys. The survey timing, methods, and effort were substantial and appropriate for the ecological values being investigated.

EcoLogical Australia (2010) identified the following significant ecological values occurring in the study area.

- Patches of Box Gum Woodland, meeting the criteria for the Threatened Ecological Community (TEC) under the *Threatened Species Conservation Act 1995* (TSC Act) and EPBC Act.
- Threatened fauna, specifically Gang-Gang Cockatoo *Callocephalon fimbriatum*, Speckled Warbler *Chthonicola sagittate*, Painted Honeyeater *Grantiella picta*, and Eastern Bentwing

[4] Queanbeyan Local Environmental Plan (2012). *Land Zoning Map - Sheet LZN_005 and LZN_006.*
[5] Queanbeyan Local Environmental Plan (2012). *Terrestrial Biodiversity Map - Sheet BIO_001.*
[6] EcoLogical Australia (2010). *Draft Flora and Fauna Assessment. Rezoning Investigations. Jumping Creek Estate, Queanbeyan.* Prepared for CIC Australia Limited, July 2010. Project No. E1080060.

Bat *Miniopterus schreibersii oceanensis*[7]. No evidence of nesting/breeding activity was observed.

- Threatened flora, specifically Hoary Sunray *Leucochrysum albicans* var. *tricolor*. The large patch of scattered Hoary Sunray identified on Figure 5 of EcoLogical Australia (2010) has since been removed by the development of the Ellerton Drive Extension. With respect to this BDAR, no Hoary Sunray plants were identified by EcoLogical Australia (2010) within the proposed development footprint.

- Areas considered to possess considerable conservation value, specifically the riparian corridors associated with sections of the Queanbeyan River and Valley Creek and the areas of relatively intact native vegetation on the margins of the study area.

1.2 Proposed Development

The proposed development involves the subdivision and subsequent development of the subject land for residential purposes. As shown in the Subdivision Layout[8], included here as Figure 2, the proposed development will subdivide the subject land to create approximately 218 new lots. The lot size[9] for the proposed development ranges from 'M – 600 m^2' to 'Y – 15,000 m^2' on land zoned 'E4 – Environmental Living'.

The proposed development includes four Water Sensitive Urban Design (WSUD) ponds at the confluence of Valley Creek and the unnamed creek, and a small park which will be situated directly to the east of the WSUD ponds. The proposed development also involves a small re-alignment of a section of Valley Creek which borders Road 12, and a more substantial re-alignment of a section of Valley Creek which boarders Road 13 (refer to Figure 2). All of the proposed impacts, including impacts associated with batters and grading, are captured within the subject land (refer to Figure 3).

For the purposes of this BDAR, the proposed development is assumed to clear all vegetation and habitat in the subject land (refer to Figure 6 and Figure 16).

1.3 Commonwealth and State Assessment and Approval Processes

1.3.1 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;

[7] Recently renamed to Large Bent-winged Bat *Miniopterus orianae aceanensis.*
[8] Spiire (2020). *Jumping Creek Subdivision*. *Development Application (DA) General Arrangement Plan*. Drawing No. 305492CA020, Rev A, 26/02/2020.
[9] Queanbeyan Local Environment Plan (2012). *Lot Size Map - Sheet LSZ_005 and LSZ_006.*

- 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 Agriculture, Water and the Environment (Commonwealth of Australia 2013a[10]). 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. The Department will then consider the referred action and the Minister (or their Delegate) will make a determination regarding whether the action requires approval under the EPBC Act and associated conditions and controls.

As mentioned previously, the proposed development was the subject of an EPBC Act referral (EPBC Act Ref:2019/8486) (the referral being informed by the previous version of this BDAR [Capital Ecology 2019]). The decision of the referral was that the proposed action (i.e. the proposed development) is **not a controlled action**. Therefore, this BDAR does not include any further assessment of the potential impacts of the proposed development on MNES listed pursuant to the EPBC Act.

1.3.2 NSW *Biodiversity Conservation Act 2016*

The NSW 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).

1.3.2.1 NSW Biodiversity Offsets 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

[10] 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.

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).

1.3.2.2 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.

1.3.3 NSW State Environmental Planning Policy (Koala Habitat Protection) 2021

The *State Environmental Planning Policy (Koala Habitat Protection) 2021* ('Koala Habitat Protection SEPP') replaced the *State Environmental Planning Policy (Koala Habitat Protection) 2020* on 17 March 2021. The associated Frequently Asked Questions[11] aim to guide consent authorities, professionals, and the community to understand and implement the requirements of the Koala Habitat Protection SEPP.

The development control provisions of the Koala Habitat Protection SEPP apply to development applications relating to land within a council area listed in Schedule 1 of the Koala Habitat Protection SEPP and:

1. *Where there is an approved Koala Plan of Management for the land*
   a. *the development application must be consistent with the approved koala plan of management that applies to the land.*
2. *Where there is no approved Koala Plan of Management for the land, if the land*
   a. *has an area of at least 1 hectare (including adjoining land within the same ownership)*

[11] Available at https://www.planning.nsw.gov.au/-/media/Files/DPE/Factsheets-and-faqs/Policy-and-legislation/faqs-Koala-SEPP-2021-development-applications-process-2021-03.pdf?la=en

Pursuant to the Koala Habitat Protection SEPP, the council may grant development consent if the applicant provides to the council—

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

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

    b. *is not core koala habitat, or*

2. *information the council is satisfied demonstrates that the land subject of the development application—*

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

    b. *includes only horticultural or agricultural plantations.*

Core koala habitat is defined as:

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

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

The Koala SEPP applies in addition to any assessments required under the EPBC Act or the BC Act (i.e. BAM assessment).

1.4 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 minimum lot sizes for the subject land are 'M' 600 m^2, 'S' 800 m^2 and 'Y' 15000 m^2 (LEP Lot Size Map - Sheet LSZ_005; Lot Size Map - Sheet LSZ_006). Therefore, in accordance with Part 7, Clause 7.2 of the BC Regulation, as the proposed development will involve the clearance of 7.24 ha of BC Act 'native vegetation' (defined in Part 5A of the *Local Land Services Act 2013* as plant species indigenous to NSW) (refer to Figure 7), a BDAR is required to assess the impacts of the proposed development. Also, the proposed development has the potential to impact threatened species and ecological communities, and a segment of Valley Creek and the buffer associated with the Queanbeyan River are identified on the Biodiversity Value Map https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap.

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.

1.4.1 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.

1.4.2 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, data entry, GIS mapping, and report preparation.

- Alan Vincent – Field Ecologist

  BSc (Hons)
  Alan undertook field surveys, data entry, and GIS mapping.

- Shannon Thompson – Field Ecologist

  BSc
  Shannon undertook field surveys and data entry.

- Jessie Murphy – Casual Ecologist

  BSc
  Jessie undertook field surveys and data entry.

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 NSW Department of Primary Industries Secretary's Animal Care and Ethics Committee (CSB 15/2046).
- Capital Ecology's NSW Scientific Licence issued by the NSW Office of Environment and Heritage under s 132 C of the NSW *National Parks and Wildlife Act 1974* (SL101623).

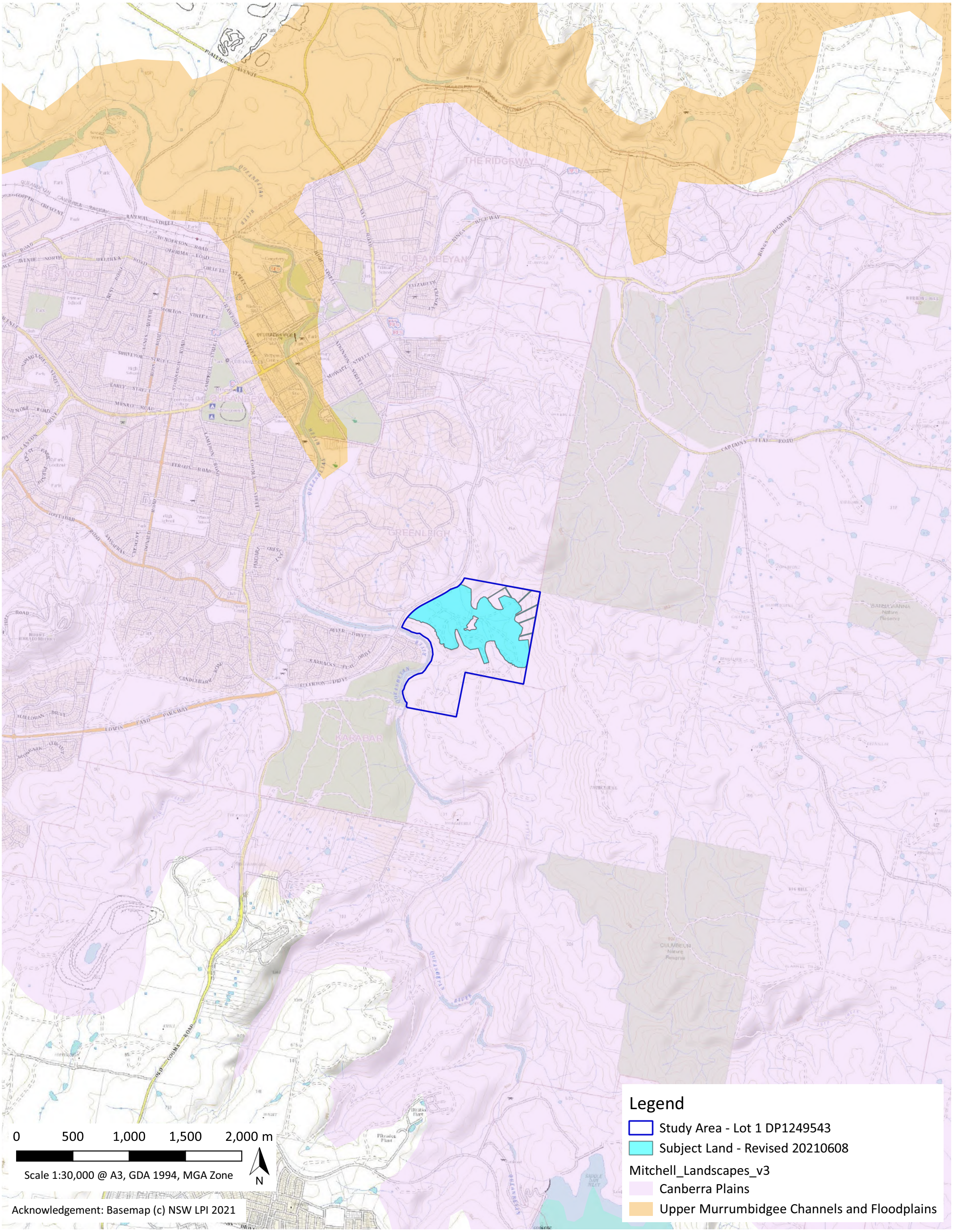
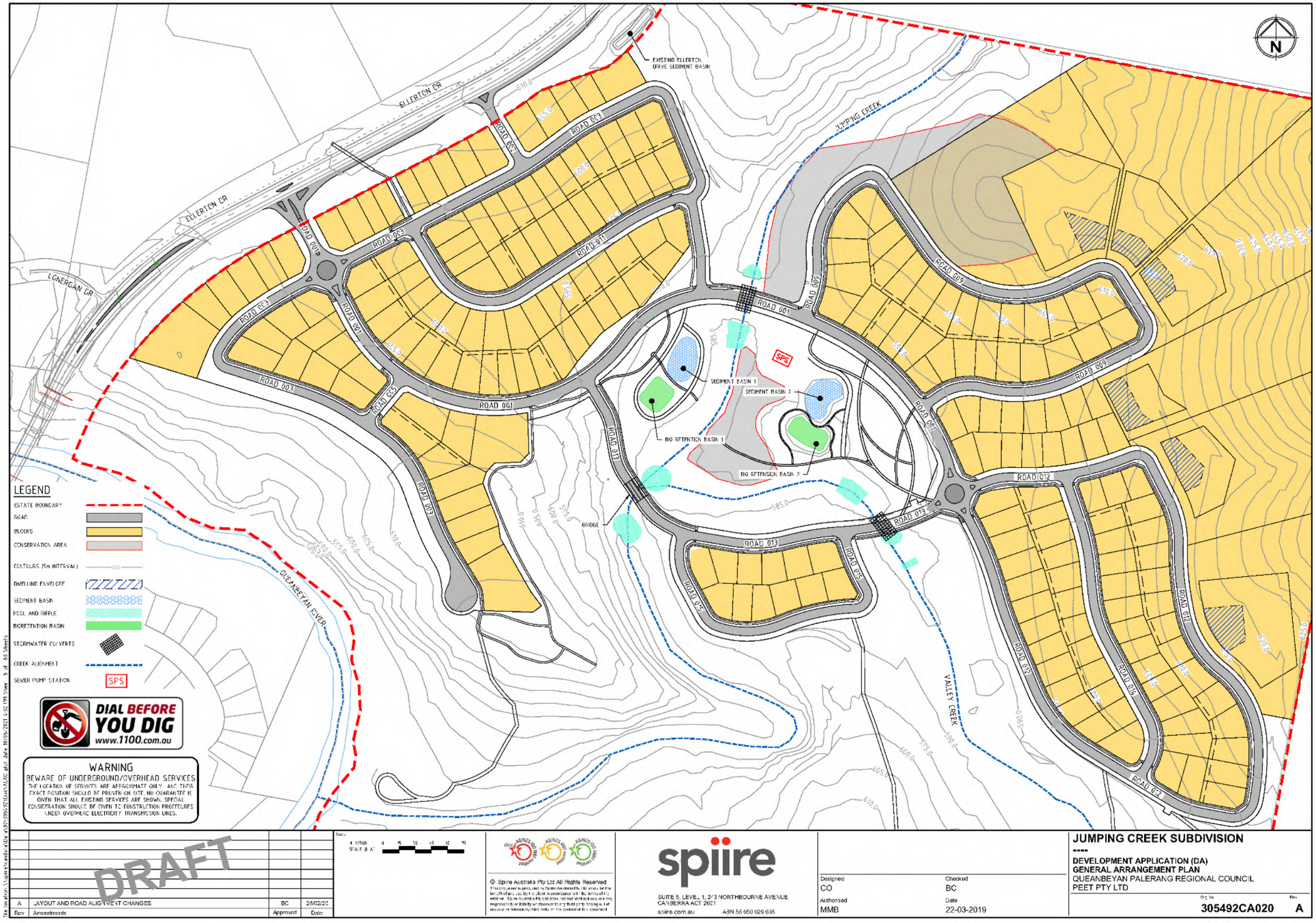


Figure 1. Locality Plan

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

Figure 2. The Proposed Development



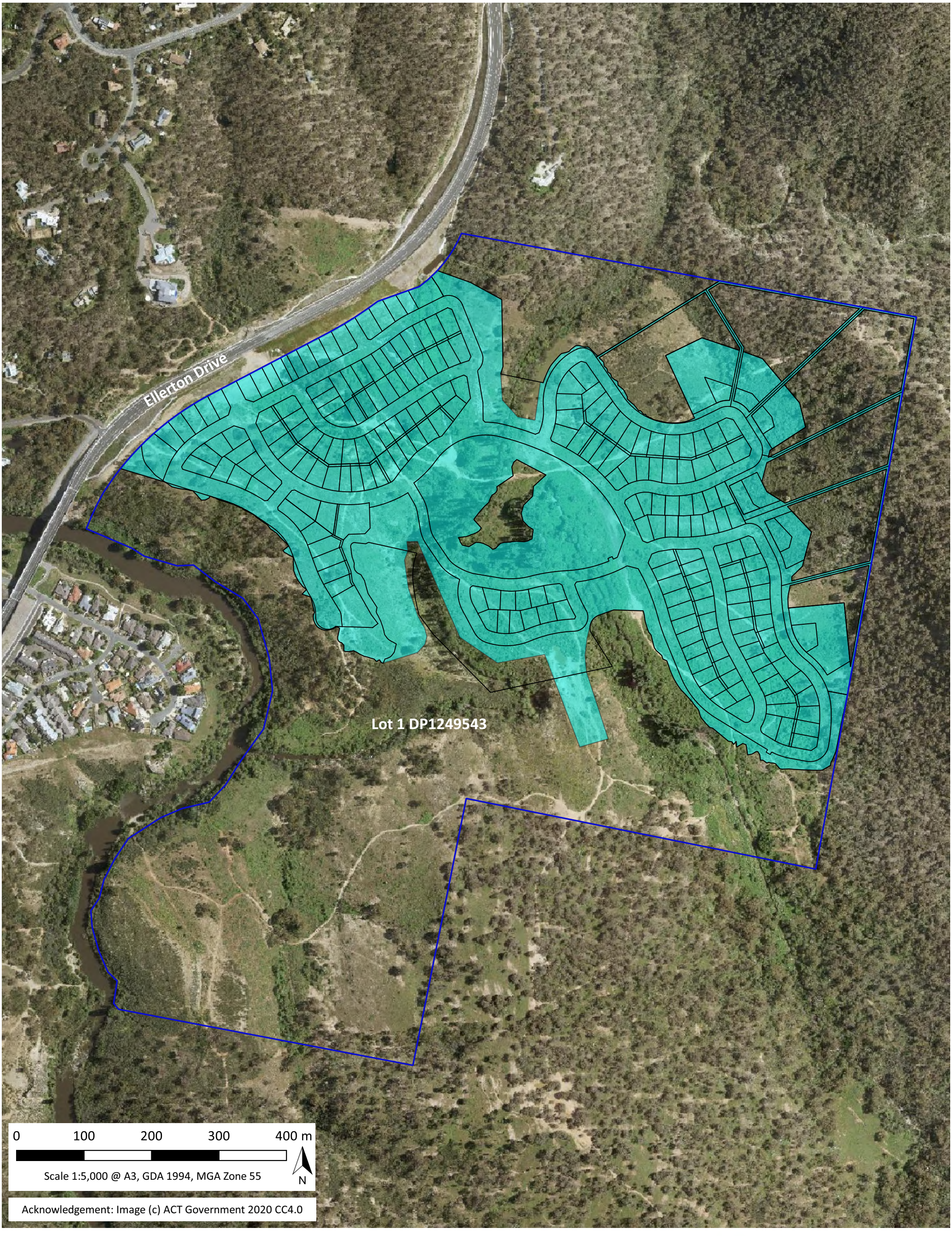


Figure 3. Proposed Development Impact Area

Legend

- Study Area - Lot 1 DP1249543
- Subject Land - Revised 20210608
- Proposed Lot Layout - Revised 20210608

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

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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 4 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.

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 (refer to Figure 3).

Table 1. Landscape features.

Landscape Feature	Description	Figure Reference
IBRA bioregion	The subject land is located in the **South Eastern Highlands** IBRA bioregion.	-
IBRA subregion	The subject land is located in the **Monaro** IBRA subregion.	-
BioNet NSW landscapes (Mitchell landscapes)	The subject land contains one Mitchell Landscape: **Canberra Plains.**	Figure 1
Rivers, streams and estuaries (Strahler[12] stream order)	Valley Creek (also known as Jumping Creek) is a 5th order stream where it enters the south-east of the study area (defined based on the NSW LPI Hydrology Map and as per Appendix 3 of the BAM). Valley Creek joins with a 5th order unnamed creek that enters from the north of the study area. From the point they join in approximately the centre of the study area, Valley Creek becomes a 6th order stream and subsequently flows south-west and joins the Queanbeyan River. A number of small, ephemeral drainage lines which flow into either Valley Creek or the unnamed creek are mapped in the study area. There is a small ephemeral dam in the subject land. Valley Creek, the unnamed creek, the ephemeral drainage lines, and the ephemeral dam had no aquatic habitat at the time of survey. They are known to remain dry throughout much of the year, with reliable flows only occurring following substantial rain events. In the study area they do not provide aquatic habitat of potential value to aquatic flora or fauna. In general, the water courses in the study area are highly modified and generally dominated by exotic fringing vegetation (e.g. Willow *Salix* sp., Blackberry *Rubus fruticosus*, Hawthorn *Crataegus monogyna*). There are sections where the fringing vegetation is in better condition and dominated by relatively intact native vegetation. These sections mainly occur along the western section of the study area that borders the Queanbeyan River. There is a moderately sized patch of relatively intact native vegetation along	Figure 3 Figure 4 Figure 6

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

Landscape Feature	Description	Figure Reference
	the western extent of Valley Creek and another along the northern section of the unnamed creek. No intact native fringing vegetation occurs in the subject land. Immediately beyond the study area the vegetation along both Valley Creek and the unnamed creek is intact, native vegetation.	
Wetlands (important wetlands)	The subject land does not contain any important wetlands as listed in the Directory of Important Wetlands in Australia (DIWA) or coastal wetlands protected under State Environmental Planning Policy No 14.	-
Connectivity	The entirety of the subject land would have historically supported woody vegetation communities. The land use history of the subject land (i.e. mining, quarrying and grazing/agriculture) has generally replaced the previous native/natural overstorey and groundstorey vegetation with either heavily cleared and disturbed land or with exotic species (e.g. Tree of Heaven *Ailanthus altissima,* Willow, Blackberry, Hawthorn, St John's Wort *Hypericum perforatum*, Paterson's Curse *Echium plantagineum*). As a result, there are only a small number of remaining patches of remnant vegetation in the subject land. The exotic vegetation and small remnant patches of native vegetation in the subject land are likely to be of some habitat value to numerous native bird species but are unlikely to constitute or comprise part of a recognised biodiversity corridor or other notable habitat connectivity feature. In the surrounding study area, there are larger stands of relatively intact native vegetation. These areas of intact native vegetation are mainly found along the Queanbeyan River corridor and the higher elevations of the study area. They are connected to wide expanses of intact native vegetation outside of the study area which extend far to the north and south (estimated to be approximately 7,500 ha in size). The intact vegetation of the Queanbeyan River corridor, Valley Creek corridor, and the woodland bordering the study area are more likely to constitute important fauna habitat and therefore are more likely to be important for connectivity. These areas are not in the subject land and will not be impacted by the proposed development.	Figure 5 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. The study area has historically been used for mining and quarrying activities. Two former mine sites were found to contain 'contaminants of potential concern'. Coffey Environments Australia (2015a[13], 2015b[14]) has developed a remediation action plan for these two former mine sites.	-
Areas of outstanding biodiversity value	The subject land does not support or occur near any declared area of outstanding biodiversity value (AOBV).	-

[13] Coffey Environments Australia (2015a). *Jumping Creek Development – Site Environmental Management Plan. Mine Site Area 3.* Prepared for CIC Australia Pty Ltd, 2 November 2015.

[14] Coffey Environments Australia (2015b). *Jumping Creek Development – Site Environmental Management Plan. Mine Site Area 4.* Prepared for CIC Australia Pty Ltd, 2 November 2015.

Landscape Feature	Description	Figure Reference
Percent native vegetation cover (buffer area)	A 1,500 m buffer was applied to the subject land resulting in an overall buffer area of 1,149 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 area of native vegetation in the buffer. 1. Woody vegetation – The areas which have a woody PCT and retain remnant woody vegetation or woody regrowth. 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. > 25%) of native groundstorey species remains (often referred to as derived or secondary grassland). Native vegetation cover was first identified and mapped via interpretation of the available aerial imagery (ACT Government and NSW LPI). The presence of remnant canopy trees, residential/ commercial development, cultivation patterns in paddocks, abnormally green and/or uniform groundstorey vegetation etc., were important factors considered during aerial interpretation. Field reconnaissance was then undertaken where possible to ground truth and refine the mapping. This field reconnaissance involved driving the publicly accessible roads within the buffer area and making observations across paddocks etc. from the roadside. As shown in Figure 5, large areas in the buffer area have been developed to the west and north-west of the subject land. As shown below, those areas which have not been developed have retained their remnant woody vegetation. 1. Woody vegetation cover – 967 ha (84%) of the buffer area was determined to support native woody vegetation cover. 2. Non-woody vegetation cover – 0 ha (0%) of the buffer area was determined to support native non-woody vegetation cover. ↓ Total native vegetation cover – the total area of native vegetation cover in the buffer area is therefore 967 ha (84%). This falls into the >70% cover class in the BAM Calculator.	Figure 5

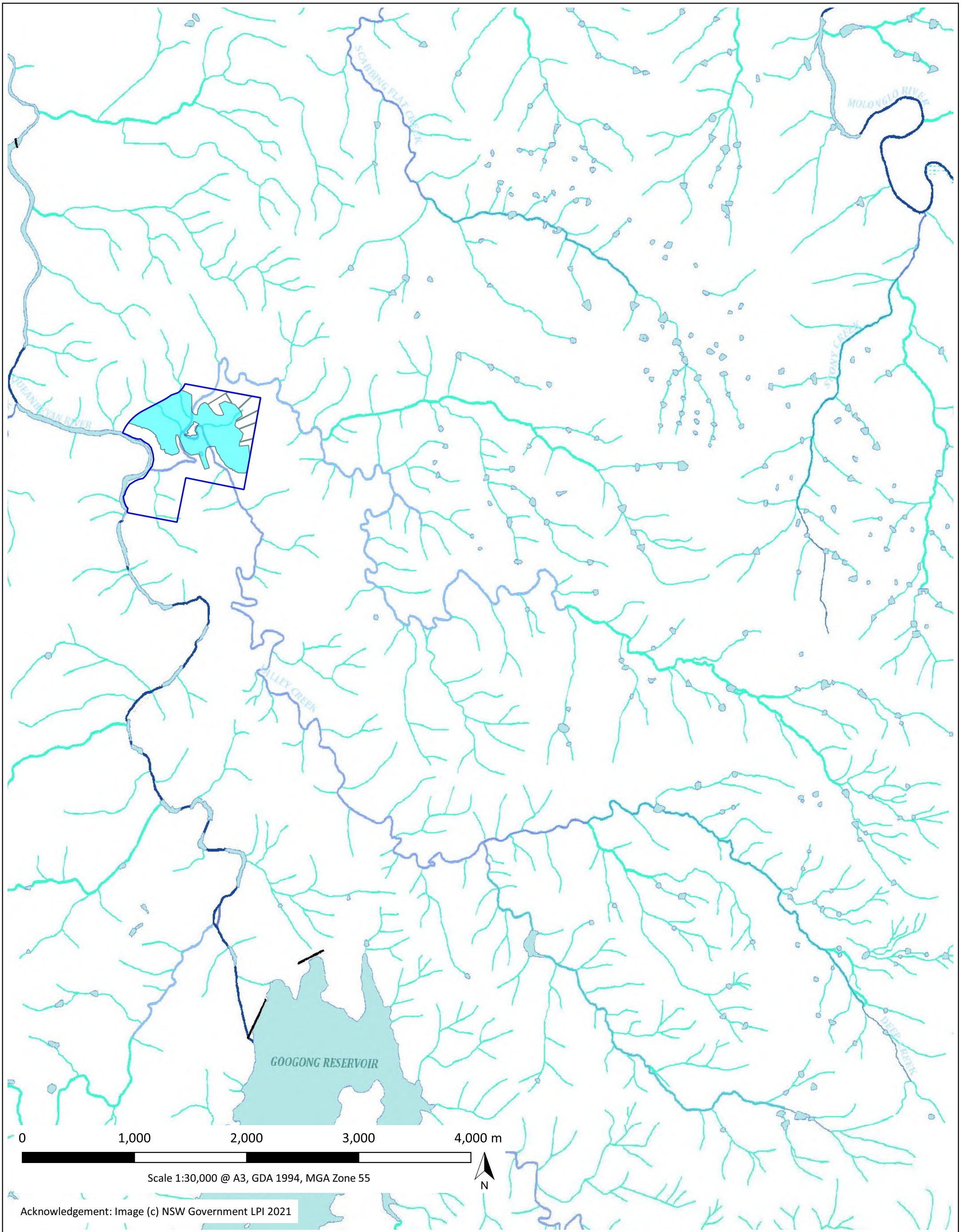

Figure 4. Hydrology

Legend

- Study Area - Lot 1 DP1249543
- Subject Land - Revised 20210608

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Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

0 1,000 2,000 3,000 4,000 m

Scale 1:45,000 @ A3, GDA 1994, MGA Zone 55

N

Acknowledgement: Image (c) NSW Government LPI 2021

Figure 5. Site Map

Legend

- Study Area - Lot 1 DP1249543
- Subject Land - Revised 20210608
- 1500 m buffer to Subject Land
- 1500 m buffer - woody native vegetation
- Pre-settlement grassland v2 1999

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

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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 study area, is classified as native vegetation.

The Commonwealth Government[15,16], ACT Government[17], and previous NSW Government[18] 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 DPIE 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.

[15] 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.
[16] Commonwealth of Australia (2016). Approved conservation advice for the Natural Temperate Grassland of the South Eastern Highlands (NTG–SEH) ecological community.
[17] ACT Government (2010). *Survey guidelines for determining lowland vegetation classification and condition in the ACT*. Environment and Sustainable Development Directorate – Conservation Planning and Research.
[18] 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 study area 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 EES website https://www.environment.nsw.gov.au/biodiversity/assessmentmethod.htm.

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	Random meander	31/07/2018 02/11/2018	1 person 2 people	8 hours 16 hours
Vegetation assessment	BAM plot	16/11/2018 26/11/2018	4 people 4 people	32 hours 32 hours
Tree habitat assessment	Tree survey	28/11/2019	2 people	4 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 study area 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).

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 study area.

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. As illustrated in Diagram 8 from NSW Government (2018a[19]), each BAM Plot involved:

a. one 20 x 20 m (400 m^2) plot, used to assess the composition and structure attributes;

b. one 20 x 50 m plot (1,000 m^2) plot, used to assess the function attributes; and

c. five 1 m^2 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 (refer to Figure 3). BAM plot locations were spread throughout the entire study area (refer to Figure 6). The information collected during this process was subsequently used to determine the condition of the vegetation present in the subject land. This approach resulted in the assessment of a greater number of BAM plots than if the subject land were considered in isolation, the outcome of which is a more thorough assessment of the condition of the vegetation in the subject land.

The minimum number of BAM plots completed in each vegetation zone of the study area was determined as per the minimum required plot numbers specified in Table 4 of the BAM. As shown in Figure 6, a total of 23 plots were completed across six vegetation zones.

As stated in Section 5.1.1.5 of the BAM:

> '*areas that are not native vegetation (i.e. land not included in native vegetation extent) do not require further assessment in the BAM except where:*
>
> *(a) they are proposed for restoration as part of an offset (refer to Stage 3)*
>
> *(b) they are assessed as habitat for threatened species according to Section 6.4.*

However, plots were completed in zones which did not meet the definition of BC Act 'native vegetation' (i.e. PCT1093 Zone 3 and PCT1334 Zone 3, Figure 6, Figure 7). Surveying all zones ensured 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 study area.

[19] NSW Government (2018a). *Biodiversity Assessment Method Operational Manual – Stage 1*. State of New South Wales and Office of Environment and Heritage.

It is important to highlight that only those zones which are classified as BC Act native vegetation and/or threatened species habitat are subsequently used to determine the impact of the proposed development (refer to Section 2.2.4.4 and Section 3.2).

2.2.2.4 Tree habitat assessment

All of the mature remnant trees (i.e. >20 cm DBH) present in, or directly adjacent to, 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 was observed, the tree was identified to species level and assessed for its value to native fauna (Appendix C). As shown in Figure 8, 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.

The data collected during this process was used to determine the number of hollow bearing trees impacted by the proposed development and informed the threatened bird survey (Section 2.2.3.1), fauna nesting survey (Section 2.2.3.2), stag-watching survey (Section 2.2.3.3), and threatened nocturnal fauna survey (Section 2.2.3.4).

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', see Section 2.3.4). 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. Survey dates and survey effort for the remaining species considered to have the potential to occur in the subject land are detailed in Table 3. Weather conditions for survey dates are shown in Table 4. In total, 180-person hours were spent on site during the development of this BDAR, plus an additional 240 hours of Anabat® recordings.

Table 3. Flora and fauna survey dates and survey effort.

Task	Method	Date	Personnel	Survey effort
Threatened flora and threatened bird survey	Transect survey (flora only)	28/11/2019	2 people	10 hours
	Area search (birds only)	28/11/2019	2 people	8 hours
	Random meander through likely habitat	31/07/2018 02/11/2018 05/11/2018	1 person 2 people 4 people	8 hours 16 hours 32 hours
	Opportunistic observations	10/09/2018 16/11/2018 26/11/2018 28/11/2019	3 people 4 people 4 people 4 people	24 hours 32 hours 32 hours 20 hours
Fauna nesting survey	Tree survey	28/11/2019	2 people	2 hours

Task	Method	Date	Personnel	Survey effort
Stag-watching survey	Dusk survey of hollow-bearing trees	28/11/2019 28/01/2020	4 people 3 people	4 hours 3 hours
Threatened nocturnal fauna survey	Random meander through likely habitat	28/11/2019 28/01/2020	4 people 3 people	4 hours 3 hours
Pink-tailed Legless Lizard survey	Rock turning survey	10/09/2018	3 people	24 hours
Threatened bat survey	Anabat®	16/11/2018 17/11/2018 18/11/2018 28/11/2019 29/11/2019 30/11/2019 1/12/2019 2/12/2019 3/12/2019 4/12/2019 5/12/2019 6/12/2019	Two Anabat® locations per night.	240 hours of recordings

Table 4. Survey weather conditions.

Date	Temperature Min-Max	Wind @ 3pm	Cloud (8th)	Rain
31/07/2018	3.6 – 12.1°C	13 km/h	8	0.4 mm
10/09/2018	0.9 – 19.7°C	15 km/h	0	0 mm
02/11/2018	17.4 – 33.4°C	19 km/h	8	0 mm
05/11/2018	11.8 – 27.5°C	37 km/h	8	0 mm
16/11/2018	11.4 – 23.7°C	9 km/h	0	0.2 mm
17/11/2018	11.0 – 21.9°C	24 km/h	6	0 mm
18/11/2018	10.7 – 22.2°C	24 km/h	7	0 mm
26/11/2018	8.0 – 23.8°C	7 km/h	8	1.0 mm
28/11/2019	5.6 – 30.3°C	19 km/h	0	0 mm
29/11/2019	12.6 – 33.1°C	7 km/h	0	0 mm
30/11/2019	11.8 – 23.8°C	30 km/h	8	0 mm
1/12/2019	4.6 – 21.5°C	37 km/h	8	0 mm
2/12/2019	7.4 – 15.1°C	33 km/h	8	0.6 mm
3/12/2019	8.5 – 20.8°C	41 km/h	0	0.6 mm
4/12/2019	12.6 – 24.1°C	35 km/h	0	0 mm
5/12/2019	11.2 – 28.2°C	35 km/h	0	0 mm
6/12/2019	15.7 – 28.0°C	30 km/h	0	0 mm
28/01/2020	20.5 – N/A°C	28 km/h	0	0 mm

2.2.3.1 Threatened flora and bird 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 flora species and threatened bird species. Some threatened flora species and threatened bird species are identified by the BAM as a species credit species (refer 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.

Therefore, a targeted threatened flora transect survey was conducted across the portions of the subject land identified as potentially supporting threatened flora species, these being the less disturbed PCT999 Zones 1 and 2 and PCT1334 Zones 1 and 2 (Figure 10). The transect survey involved two ecologists walking multiple transects across the identified areas (totalling 10 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.

In addition to the targeted flora search, targeted threatened bird surveys were conducted in the areas of more intact woody vegetation (Figure 11). As described in Section 5 of DEC (2004[20]), these surveys involved 'area searches' (Loyn 1986[21]) to identify and record the terrestrial birds occurring in the subject land. If detected, significant species identified were recorded via a GPS waypoint and notes were taken on any nesting/breeding activity.

In addition to the transect flora survey and area bird searches, random meander searches were conducted throughout the subject land and study area, targeting both significant flora and bird species. These searches involved three full days of survey by one to four ecologists, totalling 56 hours of effective survey effort. Note that the survey path for the random meander searches was only recorded for 5 November 2018 (Figure 10 and Figure 11). In addition, the survey track for 5 November 2018 presented in Figure 10 and Figure 11 only shows the path of one of the four ecologists. In general, the four ecologists involved in the survey were separated by 10 – 50 m. Therefore, in order to better reflect survey coverage, a buffer of 25 m has been applied to the recorded survey track.

Surveys were timed to coincide with the peak flowering period for the significant flora species with the potential to occur in the subject land and with the nesting period for the significant bird species with the potential to occur in the subject land.

In combination, the above surveys were considered sufficient for the size of the subject land and the condition of the vegetation.

However, a thorough inventory of the flora and fauna species occurring at a study area on the Southern Tablelands cannot be fully compiled from surveys undertaken during specific days over spring and summer. 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 study area was commenced during the preliminary

[20] DEC (2004). *Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft)*. New South Wales Department of Environment and Conservation, Hurstville, NSW.
[21] 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.

field inspection (31 July 2018) and supplemented across all of the subsequent surveys undertaken until the final survey (28 January 2020). These inventories are presented in Appendix B (flora) and Appendix D (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 counted or estimated.

2.2.3.2 Fauna nesting survey

As mentioned in Section 2.2.2.4, all of the mature remnant trees (i.e. >20 cm DBH) present in the subject land were assessed for fauna habitat features (Appendix C). As shown in Figure 8 and Figure 11, 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.

Surveys were timed to coincide with the nesting period for the significant bird species with the potential to occur in the subject land.

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 Section 2.3.4). Accordingly, targeted surveys are required to determine the species credit value of the subject land for these species.

As detailed below, nocturnal surveys were conducted in late November and late-January as this was considered appropriate for the species identified as potential species credit species (Section 2.3.4). An inventory of all nocturnal fauna species identified in the subject land is included in Appendix C (fauna).

Stag-watching survey

Stag-watching of selected hollow-bearing trees was undertaken from sunset on 28 November 2019 and 28 January 2020 (Figure 12). Trees with large hollows (i.e. > 20 cm diameter hollow entrance) were identified during the tree habitat assessment (Section 2.2.2.4, Appendix C) and were selected for stag-watching as they were considered to have a greater potential to support a wider array of threatened nocturnal fauna, including some of the species credit species identified in Section 2.3.4. Accordingly, hollows were watched for the emergence of nocturnal fauna for one hour from sunset, with the aid of binoculars and spotlights as required. Listening for vocalisations of nocturnal fauna was also undertaken during stag-watching surveys.

Spotlight survey

Two random meander searches were conducted throughout the subject land, targeting significant nocturnal fauna species (Figure 12). Each search involved two 1-hour surveys by three to four ecologists on 28 November 2019 and 28 January 2020 (Table 3). This was considered sufficient given the size of the subject land. The targeted search began one hour after sunset and involved 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 intact remnant vegetation. Particular attention was given to the patches of remnant vegetation containing the hollow-bearing trees identified in Section 2.2.2.4 (Figure 12, Appendix C). Listening for vocalisations of nocturnal fauna was also undertaken during the spotlight surveys.

2.2.3.4 Pink-tailed Legless Lizard survey

A targeted survey was completed on Monday 10 September 2018, a sunny day with minimum temperature of 0.9 °C and maximum of 19.7 °C (Bureau of Meteorology records for nearest weather station, Canberra Airport). As search success appears to be greatest following substantial rain, the survey was timed to occur following the 24.6 mm of rain received across the locality on Friday 7 September 2018. These conditions were considered optimal for Pink-tailed Legless Lizard survey. Approximately 24 person-hours were spent during the survey (three ecologists for approximately eight hours). Note that the survey tracks presented in Figure 13 only show the path of one of the three ecologists. In general, the three ecologists involved in the survey were separated by 10 – 50 m. Therefore, in order to better reflect survey coverage, a buffer of 25 m has been applied to the recorded survey track.

Prior to the on-ground surveys, Capital Ecology analysed 2018 and 2019 aerial imagery in order to identify areas of potential habitat (i.e. areas containing surface rock) across the study area. These areas are included in Figure 13.

As shown in Figure 13, each patch of potential Pink-tailed Legless Lizard habitat in the study area was surveyed for Pink-tailed Legless Lizard individuals. The survey involved the following.

- Searches for Pink-tailed Legless Lizard individuals or sloughed skins by carefully turning rocks over and then placing them back into position.
- Turning a minimum of 500 rocks per patch (considered adequate for confirming occurrence at large sites based on averages for detection presented in Jones 1999[22]), or until a Pink-tailed Legless Lizard was found and thus presence in the patch confirmed. Where it was not possible to turn 500 rocks because of a shortage of surface rock, all possible rocks were turned.

If discovered, each Pink-tailed Legless Lizard is classified as either an adult (≥12 cm total length), juvenile (≤12 cm total length), or sloughed skin and the position recorded via a handheld GPS.

The above survey methodology is consistent with the Commonwealth Survey Guidelines[23].

2.2.3.5 Anabat® threatened bat surveys

Two Anabat® detectors were deployed over three nights from 16 – 18 November 2018 and over 9 nights from 28 November 2019 – 6 December 2019, the locations of which are illustrated in Figure 14. Locations were chosen to survey across a variety of the habitat types that are present in the study area.

Particular consideration was given to the sections of the subject land that have the potential to support the Southern Myotis *Myotis macropus* (BC Act vulnerable). As described in Table 16, the Southern Myotis is dependent on waterways (i.e. medium to large permanent creeks, rivers, lakes or other waterways with pools/stretches 3 m wide or greater) for foraging. Habitat surrounding such

[22] Jones, S.R. (1999). *Conservation biology of the pink-tailed worm lizard (Aprasia parapulchella)*. PhD thesis Applied Ecology research group, University of Canberra.
[23] Department of Sustainability Environment, Water, Population and Communities (2011). *Survey guidelines for Australia's threatened reptiles.* Commonwealth of Australia, Canberra.

waterways is used for breeding and roosting. As described in the Threatened Biodiversity Data Collection (TBDC):

> *All habitat on the subject land where the subject land is within 200 m of a waterbody with pools/stretches 3 m or wider including rivers, creeks, billabongs, lagoons, dams and other waterbodies on the subject land must be mapped. Use aerial imagery to map waterbodies with pools/stretches 3 m or wider on or within 200 m of the subject land. Species polygon boundaries should align with PCTs on the subject land to which the species is associated that are within 200m of waterbodies mapped.*

As such, the boundaries of Queanbeyan River and Valley Creek were mapped in GIS from aerial imagery and a 200 m buffer was applied. All areas of PCT1093 Zone 1, PCT1334 Zone 1, and PCT1334 Zone 2 that occur within the 200 m buffer were identified as potential Sothern Myotis habitat (Figure 14). PCT1093 Zone 2, PCT1093 Zone 3, and PCT1334 Zone 3 are not considered potential Southern Myotis habitat due to the lack of a canopy and/or the high degree of disturbance (refer to Section 2.2.4). Accordingly, two Anabat® detectors were located for a total of 18 trap nights within the two main patches of potential Southern Myotis habitat in the subject land (Figure 14). The above survey technique is consistent with the NSW Government survey guidelines[24].

The weather conditions during the survey period are detailed in Table 4. The data from the Anabat® surveys were provided to Fly By Night Bat Surveys Pty Ltd for expert analysis and identification of the species recorded, the results of which are included as Appendix E. Fly By Night Bat Surveys Pty Ltd were specifically asked to look for any calls which could be the Southern Myotis.

2.2.4 Vegetation survey and mapping results

2.2.4.1 Plant Community Type (PCT) mapping

Before European settlement, the whole of the study area would have been characterised by woody PCTs. These woody PCTs were likely to have included open grassy woodland extending from the riparian corridors to the flatter, more gently sloping foothills (PCT1334), merging with dry sclerophyll forest on the higher elevated areas (PCT1093).

The whole of the subject land and the majority of the study area has been utilised over an extended period for various purposes, including mining, quarrying and grazing/agriculture. As a result, approximately 73% of the study area (rising to approximately 89% when the subject land is considered in isolation) has been cleared and the majority of the vegetation which remains is highly modified and dominated by exotic species such as Tree of Heaven, Willow, Blackberry, Hawthorn, St John's Wort, and Paterson's Curse (Figure 6).

There are some stands of relatively intact native vegetation in the study area (Figure 6). These areas occur along sections of the riparian corridors, the higher elevated portions of the study area, and the south-eastern boundary of the study area. In the subject land, there are a few, small patches of remnant vegetation.

The study area supports two PCTs, as shown in Figure 6 and Table 5.

[24] NSW Government (2018b). *'Species credit' threatened bats and their habitats. NSW survey guide for the Biodiversity Assessment Method.* Published by the Office of Environment and Heritage, September 2018.

Table 5. PCTs recorded in the subject land.

PCT	PCT name	PCT description	Occurrence on study area	TEC status Commonwealth / NSW	PCT % cleared
1093	Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	This community occurs on ridges and slopes between 550 m and 1150 m on the Southern and Central Tablelands. In its climax form this community would have been characterised by a low open forest or woodland with a canopy dominated by Red Stringybark, Brittle Gum and Inland Scribbly Gum and an understorey of sclerophyll shrubs with a sparse groundlayer.	This PCT was mapped across the higher elevated parts of the study area.	Not listed	61%
1334	Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion	This PCT occurs on valley flats, midslopes, and occasionally on crests. It is found in the Murrumbidgee River valley south of Royalla, the upper Shoalhaven River valley south of Bungonia, east of Queanbeyan, and south of Bungendore. It is characterised by an open woodland with a grassy groundlayer and sparse shrubstorey and midstorey. Dominant overstorey species include Yellow Box and Apple Box.	This PCT was mapped across the flatter low-lying parts of the study area and down into the river and creek corridors.	Critically Endangered (Commonwealth and NSW) when occurring in a condition consistent with the listing criteria of the TEC.	92%

2.2.4.2 Vegetation zones

As illustrated in Figure 6, PCT1093 and PCT1334 both contain three vegetation zones.

- PCT1093 Zones 1 and 2 contain a moderately diverse native groundstorey and are distinguished by the presence (Zone 1) or absence (Zone 2) of an overstorey.
- PCT1334 Zones 1 and 2 possess a native overstorey and are distinguished by the presence of a moderately diverse native groundstorey (Zone 1) or a low diversity exotic groundstorey (Zone 2).
- Both PCT1093 Zone 3 and PCT1334 Zone 3 lack all native strata and are instead dominated by a diversity of exotic trees, shrubs, forbs, and grasses.

As shown in Table 6 to Table 11, only a subset of the vegetation zones of each PCT meet the definition of BC Act 'native vegetation' (i.e. PCT1093 Zones 1 and 2, PCT1334 Zones 1 and 2, Figure 6

and Figure 7). As described in Section 2.2.2 and Section 2.2.4.4, these zones are assessed to determine vegetation integrity scores and the impact associated with the proposed development.

The remaining vegetation zones (i.e. PCT1093 Zone 3 and PCT1334 Zone 3) are clearly dominated by exotic grasses and forbs (i.e. > 65% perennial exotic) and do not contain a sufficient cover of native trees and/or shrubs. As per Chapter 5 of the BAM these zones do not require assessment to determine a vegetation integrity score unless they are determined to be threatened species habitat. As detailed in Table 16 and Section 2.3.4.2, PCT1093 Zone 3 and PCT1334 Zone 3 are not identified as habitat for threatened species and therefore do not require assessment to determine a vegetation integrity score.

Table 6. PCT1093 Zone 1 results summary.

	PCT1093 Zone 1
Description	Remnant dry sclerophyll forest with all strata intact. Vegetation is in good condition, characterised by a native dominant groundstorey with a moderate to high diversity of native shrubs and forbs. There is some evidence of historic fire damage. This zone is mainly restricted to the higher elevations along the northern and eastern boundaries of the study area.
Area – study area	9.78 ha.
Area – subject land	1.48 ha.
BAM plots assessed	3
Overstorey Species	Co-dominant = *E. macrorhynca*, *E. polyanthemos* and *E. rossii.*
Overstorey Cover	20% - 35%.
Overstorey Regeneration	Yes.
Perennial Groundlayer	79% - 100% native.
Significant Weeds	St John's Wort, Briar rose *Rosa rubiginosa*, and Tree of Heaven.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	Yes.

Table 7. PCT1093 Zone 2 results summary.

	PCT1093 Zone 2
Description	The native overstorey has been historically cleared across the entire zone. The woody vegetation which remains is largely Burgan *Kunzea ericoides* regeneration, which can occur at high densities (Projected Foliage Cover of up to 85%). The groundstorey is sparse but dominated by native grasses and a moderate to high diversity of native forbs. There is some evidence of historic fire damage.
Area – study area	7.12 ha.
Area – subject land	2.93 ha.
BAM plots assessed	3
Overstorey Species	None.
Overstorey Cover	0%.
Overstorey Regeneration	No.
Perennial Groundlayer	95% - 100% native.
Significant Weeds	St John's Wort, Serrated Tussock, and Tree of Heaven.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	Yes.

Table 8. PCT1093 Zone 3 results summary.

	PCT1093 Zone 3
Description	Highly modified vegetation dominated by a diversity of exotic trees, shrubs, and forbs. Human activities have had a significant impact. The native overstorey and midstorey have been cleared and there is a high diversity and cover of significant weeds. The groundstorey dominated by exotic species.
Area – study area	4.93 ha.
Area – subject land	4.31 ha.
BAM plots assessed	2
Overstorey Species	None.
Overstorey Cover	0% - 1.5%.
Overstorey Regeneration	None.
Perennial Groundlayer	2% - 28% native.
Significant Weeds	Hawthorn, St John's Wort, Serrated Tussock, Briar Rose, and Blackberry.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	No.

Table 9. PCT1334 Zone 1 results summary.

	PCT1334 Zone 1
Description	Remnant woodland with all strata intact. Vegetation is in good condition, characterised by a native dominant groundstorey with a moderate to high diversity of native shrubs and forbs. This zone is mainly restricted to the river/creek corridors and the southern boundary of the study area.
Area – study area	13.13 ha.
Area – subject land	0.85 ha.
BAM plots assessed	5
Overstorey Species	Co-dominant = *E. melliodora* and *E. bridgesiana.*
Overstorey Cover	15% - 45%.
Overstorey Regeneration	Yes.
Perennial Groundlayer	77% - 99% native.
Significant Weeds	Hawthorn, St John's Wort, Serrated Tussock, Briar rose, Blackberry, and Orange Firethorn *Pyracantha angustifolia*.
EPBC Act and/or BC Act listed TEC	Yes (EPBC Act and BC Act).
BC Act Native Vegetation	Yes.

Table 10. PCT1334 Zone 2 results summary.

	PCT1334 Zone 2
Description	Woodland characterised by a native overstorey with a partially cleared midstorey and shrubstorey. The low diversity groundstorey is dominated by exotic grasses and forbs. Human activities have had an impact on this zone and there is evidence of historic clearing, grazing damage, and the presence of a moderate cover of significant weeds.
Area – study area	2.44 ha.
Area – subject land	1.98 ha.
BAM plots assessed	2
Overstorey Species	Co-dominant = *E. melliodora* and *E. bridgesiana.*
Overstorey Cover	15% - 55%.
Overstorey Regeneration	Yes.
Perennial Groundlayer	15% - 50% native.
Significant Weeds	St John's Wort, Serrated Tussock, Briar Rose, and Blackberry.
EPBC Act and/or BC Act listed TEC	Yes (BC Act).
BC Act Native Vegetation	Yes.

Table 11. PCT1334 Zone 3 results summary.

	PCT1334 Zone 3
Description	Highly modified vegetation dominated by a diversity of exotic trees, shrubs and forbs. Human activities have had a significant impact. The native overstorey and midstorey have been cleared, and there is a high diversity and cover of significant weeds. The groundstorey is dominated by exotic species.
Area – study area	55.90 ha.
Area – subject land	27.85 ha.
BAM plots assessed	8
Overstorey Species	Planted *Eucalyptus* sp.
Overstorey Cover	0% - 5%.
Overstorey Regeneration	None.
Perennial Groundlayer	0% - 27% native.
Significant Weeds	Hawthorn, St John's Wort, Serrated Tussock, Briar Rose, Blackberry, Tree of Heaven, Black Poplar *Populus nigra*, and Orange Firethorn.
EPBC Act and/or BC Act listed TEC	No.
BC Act Native Vegetation	No.

2.2.4.3 Patch size

As defined in the BAM, patch size is -

> *"an area of intact 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 100m from the next area of moderate to good condition native vegetation (or ≤30m for non-woody ecosystems).*
>
> *Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site."*

Where intact vegetation is defined as –

> *"vegetation where all tree, shrub, grass and/or forb structural growth form groups expected for a plant community type are present"*

With respect to the above, the vegetation zones in the subject land which meet the definition of intact are:

- PCT1093 Zone 1;
- PCT1334 Zone 1; and
- PCT1334 Zone 2.

The intact native vegetation outside of the subject land extends far to the north and south (Figure 5). When vegetation from adjoining land is considered the patch size for each of the above vegetation zones is approximately 7,500 ha. This falls within the >100 ha class as defined by the BAM.

As detailed below, none of the remaining vegetation zones in the subject land meet the definition of intact vegetation as they lack some or all of the structural growth form groups expected of the PCT.

- PCT1093 Zone 2 lacks the canopy and regeneration of the canopy.
- PCT1093 Zone 3 lacks the canopy, regeneration of the canopy, midstorey, and native groundstorey.
- PCT1334 Zone 3 lacks the canopy, regeneration of the canopy, midstorey, and native groundstorey.

2.2.4.4 Vegetation integrity scores

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 (refer to Figure 3). Zones which meet the definition of BC Act 'native vegetation' and which occur in the subject land are used to determine vegetation integrity scores and the impact associated with the proposed development (refer to Figure 7). Zones which do not meet the definition of BC Act native vegetation do not require further assessment in the BAM except where:

(a) they are proposed for restoration as part of an offset; or

(b) they are assessed as habitat for threatened species.

As detailed in Table 6 to Table 11, PCT1093 Zones 1 and 2 and PCT1334 Zones 1 and 2 meet the definition of BC Act 'native vegetation'. PCT1093 Zone 3 and PCT1334 Zone 3 are clearly dominated by exotic grasses and forbs and do not meet the definition of BC Act native vegetation. As detailed in Table 16 and Section 2.3.4.2, these zones are not identified as habitat for threatened species. Therefore, as per Chapter 5 of the BAM, PCT1093 Zone 3 and PCT1334 Zone 3 do not require assessment to determine a vegetation integrity score.

Table 12 presents the results of the BAM plot assessments and details the composition, structure, function, and resulting vegetation integrity score for those zones which occur in the subject land and meet the definition of BC Act 'native vegetation'.

Table 12. Vegetation integrity scores.

	PCT1093		**PCT1334**	
	Zone 1	**Zone 2**	**Zone 1**	**Zone 2**
Native Canopy	Yes	-	Yes	Yes
Groundstorey	Native	Native	Native	Exotic
Native Diversity	Moderate	Moderate	Moderate	Low
Patch size	> 100 ha	0 ha	> 100 ha	> 100 ha
Area in the subject land	1.48 ha	2.93 ha	0.85 ha	1.98 ha
BAM plots assessed in the study area	3	3	5	2
Composition condition score	45.3	10.7	46.6	11.8
Structure condition score	48.4	19.5	37.3	37.0
Function condition score	49.2	4.1	66.4	69.5
Current vegetation integrity score	**47.6**	**9.5**	**48.7**	**31.2**

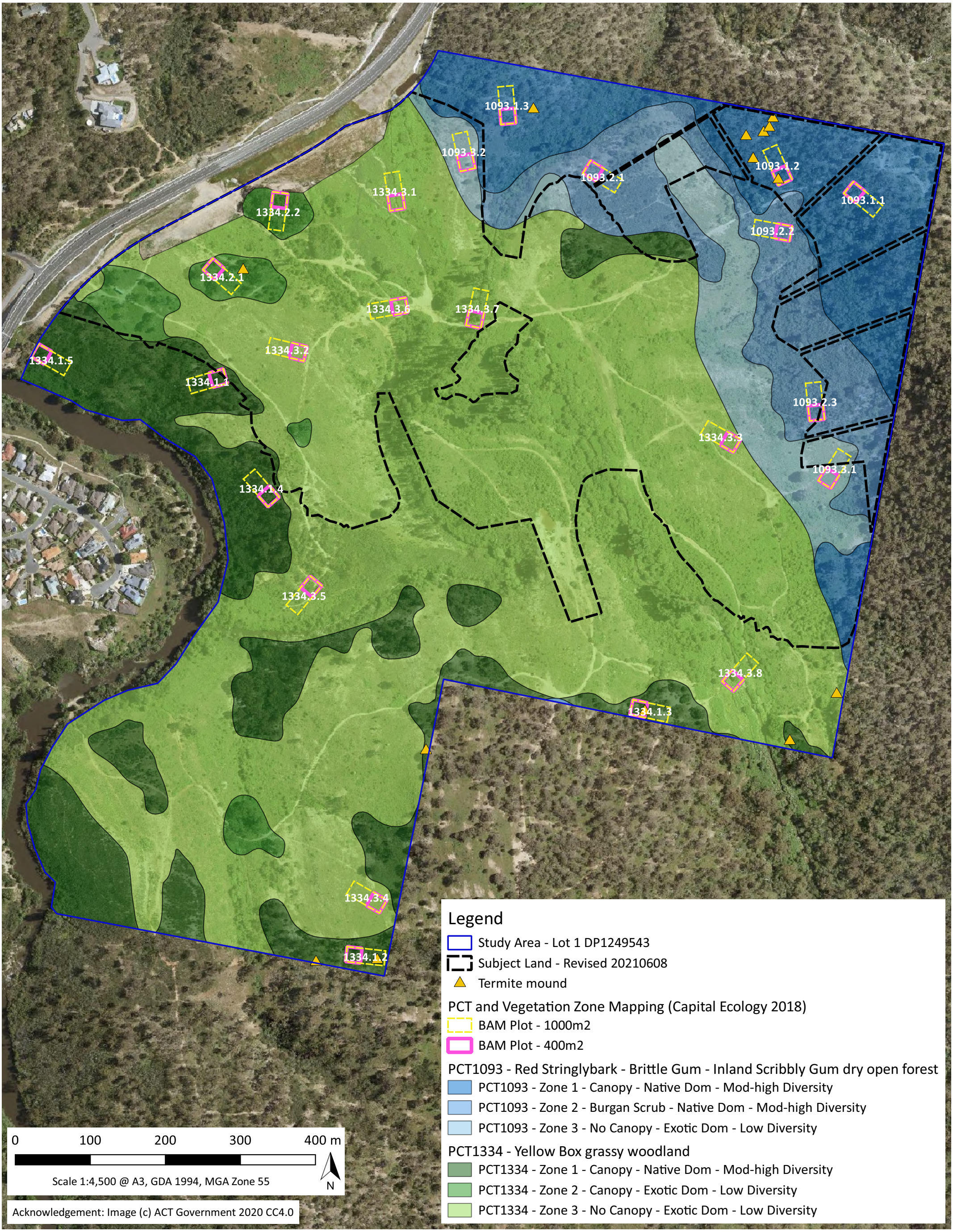

Figure 6. BAM Vegetation Mapping and Survey

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

0 100 200 300 400 m

Scale 1:4,500 @ A3, GDA 1994, MGA Zone 55

N

Acknowledgement: Image (c) ACT Government 2020 CC4.0

Figure 7. BC Act Native Vegetation

Legend

- Study Area - Lot 1 DP1249543
- Subject Land - Revised 20210608
- BC Act Native Vegetation

capital ecology

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

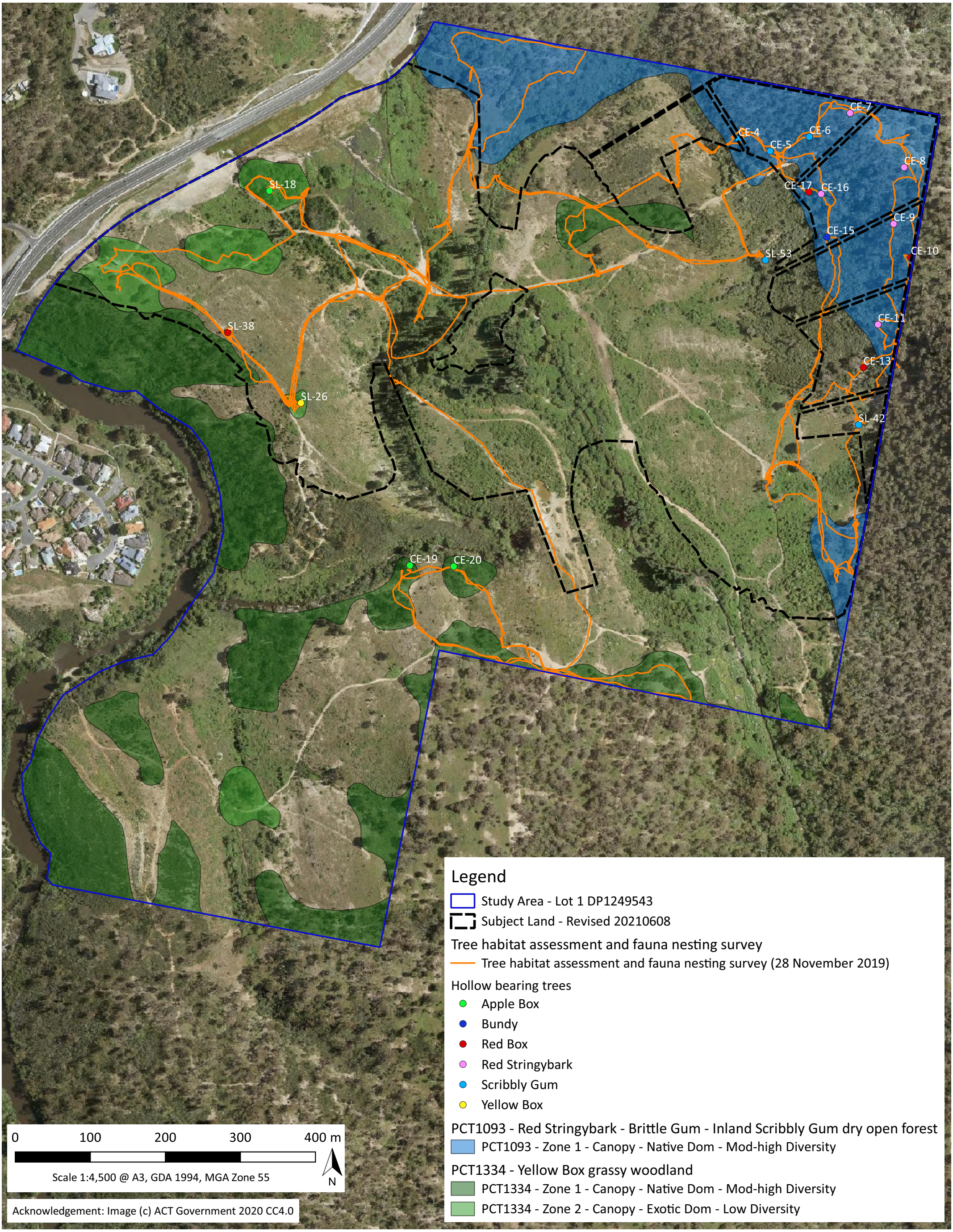

Figure 8. Tree Habitat Assessment and Fauna Nesting Survey

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

2.2.5 Threatened Ecological Communities

2.2.5.1 *Biodiversity Conservation Act 2016* (NSW)

Two BC Act listed ecological communities have the potential to occur in the subject land: *White Box – Yellow Box – Blakely's Red Gum Woodland* (BC Act Box-Gum Woodland) and *Monaro Tableland Cool Temperate Grassy Woodland in the South East Highlands 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.

The below description is extracted from the NSW *Final Determination: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland* (NSW Threatened Species Scientific Committee 2020, gazetted 17 July 2020[25]).

> *4.2. White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is characterised by widely-spaced trees with canopies not touching and projected foliage cover generally less than 30% (Prober et al. 2017) ...Understorey shrubs are typically sparse or absent (Prober et al. 2017). The groundcover is dominated by perennial tussock grasses interspersed with a diverse range of forb species with the families Asteraceae and Fabaceae, and the orders Liliales and Asparagales well represented (Prober et al. 2017).*
>
> *4.3. White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland is characteristically dominated by one or more of the species Eucalyptus albens (White Box), E. melliodora (Yellow Box) and E. blakelyi (Blakely's Red Gum) …A number of understorey species are typically found throughout almost the entire range of the community, with the exception of the extreme north of its distribution and areas where they have been excluded by grazing.*
>
> *4.10. The distribution of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland spans a range in elevation from approximately 170 m ASL on the western slopes of the Great Dividing Range to approximately 1200 m on the Northern Tablelands of NSW (Beadle 1981), although occurrences on the ranges are typically at lower elevations (Prober et al. 2017). The topography on which the community occurs ranges from flat in the west of its range to hilly and undulating in the east (Prober and Thiele 2004).*
>
> *4.12. …For the purpose of establishing the risk of ecosystem/community collapse due to ongoing decline in distribution, it is not possible on the basis of available data, to specify thresholds in either tree cover or species diversity which are indicative of loss of function because: i) no single threshold is appropriate for the range of circumstances and pathways leading to different states of degradation (and hence the potential for recovery); ii) the point at which an ecological community has ceased to function in its original form is inherently uncertain, and the scientific basis upon which symptoms such as loss of tree cover and diversity can be related to ecological function is not established in this case; and iii) recovery may be dependent on active remediation, therefore thresholds can not be determined in absolute terms because they depend on social (collective will) and economic (cost of remediation) factors.*
>
> *3.1.4. The condition of remnants ranges from relatively good to highly degraded, such as paddock remnants with weedy understories and only a few hardy natives left. Some remnants of*

[25] NSW Threatened Species Scientific Committee (2020). *Final Determination: White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland*. Gazetted 17 July 2020.

the community may consist of only an intact overstorey or an intact understorey but may still have high conservation value due to the flora and fauna they support.

The final determination does not provide specific listing criteria against which to assess a patch of vegetation. However, as described in the final determination, 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 – Confirmed – The entire portion of the subject land mapped as PCT1334 would have once supported the climax community of this TEC (Figure 6). PCT1334 Zone 1 is characterised by a native overstorey with moderately diverse native understorey and PCT1334 Zone 2 is characterised by a native overstorey with a low diversity exotic understorey. Both PCT1334 Zones 1 and 2 support vegetation which meets the criteria for this TEC under the BC Act.

PCT1334 Zone 3 lacks a native overstorey and has a groundstorey that is highly modified and dominated by perennial exotic grasses and herbaceous weeds. As such, PCT1334 Zone 3 does not support vegetation which meets the criteria for this TEC under the BC Act.

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[26]).

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

[26] 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.

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 – Based on the recorded PCTs, plant species, landscape position, and the vegetation on adjoining and nearby properties, the subject land does not support vegetation which meets the criteria for this community under the BC Act.

Conclusion

The subject land supports the BC Act listed ecological community *White Box Yellow Box Blakely's Red Gum Woodland* in those areas mapped as PCT 1334 Zones 1 and 2 (Figure 6). No part of the subject land supports the BC Act listed ecological community *Monaro Tableland Cool Temperate Grassy Woodland in the South East Highlands Bioregion*.

2.2.6 High threat weeds

Table 13 lists the 12 high threat weeds which occur in the subject land and study area. Many of them occur at high densities and are widespread (Appendix A and Appendix B).

Table 13. High threat weeds.

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.

Species Name	Common Name	Status
Trees		
Ailanthus altissima	Tree of Heaven	LM
Populus nigra	Black Popular	-
Salix sp.	Willow	LM/AP
Shrubs		
Lycium ferocissimum	African Boxthorn	AP
Pyracantha angustifolia	Orange Firethorn	-
Rosa rubiginosa	Briar Rose	-
Rubus fruticosus aggregate	Blackberry	WoNS, LM/AP
Forb		
Conium maculatum	Hemlock	-
Echium plantagineum	Paterson's Curse	-
Hypericum perforatum	St John's Wort	LM
Solanum linnaeanum	Apple of Sodom	E

Species Name	Common Name	Status
Grass		
Nassella trichotoma	Serrated Tussock	WoNS, C

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 14. It is important to note that the information presented in Table 14 is also used to assess the presence/absence of habitat constraints and/or microhabitat features for ecosystem credits species (Section 2.3.3) and species credit species (Section 2.3.4).

Table 14. Fauna habitat features.

Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Remnant eucalypts	Historic clearing has removed approximately 73% of the native overstorey across the study area, rising to approximately 89% when the subject land is considered in isolation (Figure 6). The areas which have retained a native overstorey support a moderate number of mature remnant trees, 19 of which contain at least one functional hollow (Appendix C, Figure 8). Only four hollow-bearing trees will be impacted by the proposed development.	All remnant trees are likely to provide foraging resources for a variety of birds and marsupials when in flower, including threatened species. The 19 mature hollow bearing remnant trees may provide a nesting resource for birds, bats, and marsupials, including threatened species.
Other native vegetation (e.g. shrubs, forbs, grasses)	The majority of the subject land has been historically cleared and disturbed (Figure 6). The areas which have not been disturbed have retained a sparse cover of native shrubs, forbs and/or grasses.	The native shrubs, forbs and grasses are likely to provide a foraging resource to a variety of native birds, reptiles, and herbivores, potentially including threatened species.
Exotic trees and shrubs	The majority of the subject land is dominated by exotic trees and shrubs (Figure 6).	The exotic trees and shrubs are likely to provide a limited foraging resource to a variety common native and exotic birds. It is unlikely that the exotic trees and shrubs would be of importance as nesting or roosting habitat for any threatened fauna species.
Exotic pasture	The majority of the subject land supports a highly modified derived grassland, all of which is exotic dominant and has been heavily disturbed by historic mining, quarrying and grazing/agriculture (Figure 6). As a result, the groundlayer across this area is largely bare and only sparsely covered by exotic grasses and forbs.	The sparsely covered grassy areas would provide a limited grazing resources for common birds, reptiles, and herbivores such as the Eastern Grey Kangaroo *Macropus giganteus* and Common Wombat *Vombatus ursinus.* Open areas are likely to provide a hunting resource for raptors and other predatory birds.
Fallen timber	Fallen timber is scattered across the areas that support more intact vegetation (i.e. PCT1093 Zone 1 and PCT1334 Zone 1 and Zone 2, Figure 6).	The fallen timber is likely to provide foraging habitat and/or refugia for a variety of native mammals, birds, herpetofauna, and invertebrates.

Habitat Feature	Description	Relevant Native Fauna Species/Assemblages
Surface rock	Loose surface rock is scattered across the slopes and crests of the subject land and study area (Figure 13).	The loose surface rock is likely to provide refuge and foraging habitat for common herpetofauna and invertebrates.
Termite mounds	Fourteen termite mounds occur in the study area (Figure 6). The termite mounds are largely found in the areas of intact vegetation (PCT1093 Zone 1 and PCT1334 Zone 1). Only one termite mound will be impacted by the proposed development.	Termite mounds are likely to provide a foraging resource for Short-beaked Echidna *Tachyglossus aculeatus*, and a foraging and nesting resource for the BC Act listed Rosenberg's Goanna *Varanus rosenbergi*.
Creeks, streams, dams	Valley Creek, an unnamed creek and several tributaries pass through the subject land (Figure 4). All were dry at the time of survey and are known to remain dry throughout much of the year. Reliable flows only occur following substantial rain events. The fringing vegetation along sections of Valley creek and the unnamed creek are relatively intact.	The creeks and tributaries are unlikely to provide habitat of value to aquatic flora or fauna. However, the intact sections of fringing vegetation along Valley Creek and the unnamed creek are likely to provide a foraging resource to a variety of birds, reptiles, and herbivores, potentially including threatened species, and are likely to be important for connectivity.

2.3.2 Threatened Biodiversity Data

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 (critically endangered, 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 subject land 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 microhabitat features for species flagged by the BAM as ecosystem credits species (Section 2.3.3) and species credit species (species credit species).

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 subject land obtained using the Department of the Environment's online EPBC Act Protected Matters Search Tool (PMST) on 10 August 2018 and updated on 2 March 2021; and

- ecological point data from the NSW Wildlife Atlas (BioNet), downloaded on 10 August 2018 and updated on 17 February 2021, providing a list of threatened species which have previously been recorded in the broad locality of the subject land (i.e. within 10 km) (refer to Figure 9).

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

2.3.2.3 Likelihood of Occurrence Assessment

The Likelihood of Occurrence Assessment for threatened flora and fauna species is a categorisation used to determine the likelihood that the subject species occurs in the subject land. The results of the Likelihood of Occurrence Assessment are based on the findings of desktop studies, field surveys, expert opinion, and consideration of the species' currently recognised distribution and preferred habitat.

Threatened species and populations included in the Likelihood of Occurrence Assessment include all of those identified during the database and literature review as potentially occurring in the locality. Some BC Act listed threatened species have been included that have not been previously recorded in the locality yet are considered by Capital Ecology to have the potential to occur.

The likelihood of a species occurring in the subject land is categorised as either negligible, low, moderate or high. A species that has been identified in the subject land during the surveys for this study or by other confirmed records is labelled as confirmed.

The completed Likelihood of Occurrence Assessment is provided as Appendix F. Species assigned a moderate or higher likelihood of occurrence are considered in more detail in Section 2.3.4 as species credit species under the BAM (or as additional species if they are not flagged as species credit species).

0 1,500 3,000 4,500 6,000 m

Scale 1:85,000 @ A3, GDA 1994, MGA Zone

N

Legend

- 10000 m buffer to Subject Land
- Study Area - Lot 1 DP1249543

NSW Wildlife Atlas Threatened Speces - 10 km

- Australasian Bittern
- Barking Owl
- Black-chinned Honeyeater (eastern subspecies)
- Brown Treecreeper (eastern subspecies)
- Diamond Firetail
- Dusky Woodswallow
- Flame Robin
- Fork-tailed Swift
- Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Hooded Robin (south-eastern form)
- Little Eagle
- Little Lorikeet
- Olive Whistler
- Painted Honeyeater
- Regent Honeyeater
- Scarlet Robin
- Speckled Warbler
- Spotted Harrier
- Superb Parrot
- Swift Parrot
- Varied Sittella
- White-bellied Sea-Eagle
- White-fronted Chat
- White-throated Needletail
- Black Gum
- Button Wrinklewort
- Hoary Sunray
- Pale Pomaderris
- Thick Lip Spider Orchid
- Silky Swainson-pea
- Small Purple-pea
- Eastern False Pipistrelle
- Grey-headed Flying-fox
- Koala
- Large Bent-winged Bat
- Southern Myotis
- Spotted-tailed Quoll
- Golden Sun Moth
- Grassland Earless Dragon
- Pink-tailed Legless Lizard
- Rosenberg's Goanna
- Southern Bell Frog
- Green and Golden Bell Frog

Figure 9. NSW Wildlife Atlas Threatened Species Search

capital ecology

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

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 15. 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 15. 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
Anthochaera phrygia Regent Honeyeater (Foraging)	Critically Endangered	Critically Endangered	Yes – assumed	-
Artamus cyanopterus cyanopterus Dusky Woodswallow	Vulnerable	-	Yes – confirmed via survey	-
Callocephalon fimbriatum Gang-gang Cockatoo (Foraging)	Vulnerable	-	Yes – confirmed by EcoLogical Australia (2010)	-
Calyptorhynchus lathami Glossy Black-Cockatoo (Foraging)	Vulnerable	-	No – habitat constraint	The TBDC lists the following foraging habitat constraint: • Presence of *Allocasuarina* and *Casuarina* species. No *Allocasuarina* or *Casuarina* were recorded in the subject land (Appendix B). As such, the absence of this habitat constraint removes this species as an ecosystem credit species.
Chthonicola sagittata Speckled Warbler	Vulnerable	-	Yes – confirmed by EcoLogical Australia (2010)	-
Circus assimilis Spotted Harrier	Vulnerable	-	Yes – assumed	-

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Justification for exclusion
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	Vulnerable	-	Yes – assumed	-
Daphoenositta chrysoptera Varied Sittella	Vulnerable	-	Yes – assumed	-
Dasyurus maculatus Spotted-tailed Quoll	Vulnerable	Endangered	Yes – assumed	-
Falsistrellus tasmaniensis Eastern False Pipistrelle	Vulnerable	-	Yes – confirmed via survey	-
Glossopsitta pusilla Little Lorikeet	Vulnerable	-	Yes – assumed	-
Grantiella picta Painted Honeyeater	Vulnerable	Vulnerable	Yes – confirmed by EcoLogical Australia (2010)	-
Hieraaetus morphnoides Little Eagle (Foraging)	Vulnerable	-	Yes – assumed	-
Hirundapus caudacutus White-throated Needletail	-	Vulnerable	Yes – assumed	-
Lathamus discolor Swift Parrot (Foraging)	Endangered	Critically Endangered	Yes – assumed	-
Lophoictinia isura Square-tailed Kite (Foraging)	Vulnerable	-	Yes – assumed	-
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	Vulnerable	-	Yes – assumed	-

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Justification for exclusion
Miniopterus orianae oceanensis Large Bent-winged Bat (Foraging)	Vulnerable	-	Yes – confirmed via survey	-
Neophema pulchella Turquoise Parrot	Vulnerable	-	Yes – assumed	-
Ninox connivens Barking Owl (Foraging)	Vulnerable	-	Yes – assumed	-
Ninox strenua Powerful Owl (Foraging)	Vulnerable	-	Yes – assumed	-
Petaurus australis Yellow-bellied Glider	Vulnerable	-	Yes – assumed	-
Petroica boodang Scarlet Robin	Vulnerable	-	Yes – confirmed via survey	-
Petroica phoenicea Flame Robin	Vulnerable	-	Yes – assumed	-
Phascolarctos cinereus Koala (Foraging)	Vulnerable	Vulnerable	Yes – assumed	-
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	Vulnerable	Vulnerable	Yes – assumed	-
Stagonopleura guttata Diamond Firetail	Vulnerable	-	Yes – confirmed via survey	-
Suta flagellum Little Whip Snake	Vulnerable	-	Yes – assumed	-

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Presence	Justification for exclusion
Varanus rosenbergi 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 16. 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 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 16. 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
Anthochaera phrygia 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 mapped areas'* as a breeding habitat constraint for this species.	No – habitat constraint	The subject land and wider study area are not identified as an 'important area' for Regent Honeyeater on the 'BAM – Important Areas' map[27]. Conclusion – the subject land lacks the breeding habitat constraints required for this species.
Aprasia parapulchella 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 – microhabitat features, surveyed	While the subject land does support 'rocky areas', these areas are not characteristic of Pink-tailed Legless Lizard habitat as almost all of the surface rock occurs in heavily disturbed zones that are either dominated by exotic grasses, weeds, or bare ground (I.e. PCT1093 Zone 3 and PCT1334 Zone 3, Figure 13). In addition, extensive targeted surveys for Pink-Tailed Legless Lizard across those areas that do contain a substantial cover of loose surface rock did not detect the species (Section 2.3.4.2, Figure 13). Conclusion - the species is considered unlikely to occur in the subject land.
Caladenia tessellata Thick Lip Spider Orchid	Endangered	Vulnerable	This species is generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil. Flowers appear between September and November (but apparently generally late September or early October in extant southern populations). The Thick Lip Spider Orchid is known from the Sydney area (old records), Wyong, Ulladulla, and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border.	No – surveyed	Targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the whole of the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). The Thick Lip Spider Orchid was not detected. In addition, the species was also not detected during targeted spring surveys completed by Ecological Australia (2010) and only two records from 1942 are recorded within 10 km of the subject land (Figure 9). Conclusion - the species is considered unlikely to occur in the subject land.

[27] 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
Callocephalon fimbriatum Gang-gang Cockatoo (Breeding)	Vulnerable	-	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. Nests are located in hollows of eucalypts that are 10 cm in diameter or larger and at least 9 m above the ground in eucalypts. The TBDC lists '*Eucalypt tree species with hollows greater than 9 cm diameter*' as a breeding habitat constraint for this species.	No – surveyed	Targeted bird surveys and random meander surveys were conducted across the subject land in the areas of more intact woody vegetation (Section 2.3.4.2, Figure 11). Mature, remnant trees were also assessed for the presence/absence of habitat features and for signs of fauna nesting in hollows (Figure 8, Figure 11). No Gang-gang Cockatoos were recorded in the subject land and no sign of Gang-gang Cockatoos nesting in tree hollows was detected. Conclusion - the species is considered unlikely to breed in the subject land.
Calyptorhynchus lathami Glossy Black-Cockatoo (Breeding)	Vulnerable	-	This species inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of Sheoak occur. Black Sheoak *Allocasuarina littoralis* and Forest Sheoak *Allocasuarina torulosa* are important foods. It 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 15 cm diameter and greater than 5 m above ground as a breeding habitat constraint and notes that '*the species may need larger patches and more intact landscapes for breeding*.'	No – microhabitat features, surveyed	Field surveys did not record any strands of Sheoak in the subject land (Appendix B) and the subject land does not support 'larger patches and more intact landscapes' due do the fact that 89% of the original woody vegetation has been historically cleared. As such, the subject land lacks the primary breeding microhabitat features and has been degraded to the extent that the species is unlikely to utilise the subject land for breeding. In addition, targeted bird surveys and random meander surveys were conducted across the subject land in the areas of more intact woody vegetation (Section 2.3.4.2, Figure 11). Mature, remnant trees were also assessed for the presence/absence of habitat features and for signs of fauna nesting in hollows (Figure 8, Figure 11). No Glossy Black-Cockatoo were recorded in the subject land and no sign of Glossy Black-Cockatoo nesting in tree hollows was detected. Conclusion - the species is considered unlikely to breed in the subject land.
Cercartetus nanus 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 did not record any banksias or bottlebrushes (Appendix B). Approximately 89% of the original woody vegetation has been historically cleared and, as a result, the vegetation across the subject land is highly fragmented (Figure 6). The subject land has been heavily grazed over an extended period by stock and is currently subject to heavy grazing from native herbivores and exotic pests such as Fallow Deer *Dama dama* and European Rabbit *Oryctolagus cuniculus*. In addition, due to its proximity to existing urban areas, the subject land is likely to have undergone changed fire regimes over multiple decades. Finally, the species was not seen or heard during stag-watch surveys (Section 2.3.4.2, Figure 12), spotlighting surveys (Section 2.3.4.2, Figure 12), or previous ecological investigations of the study area (Ecological Australia 2010) and has not been recorded within 10 km of the subject land (Figure 9). Conclusion - the subject land lacks the primary microhabitat features required for this species and the habitat has been substantially degraded by identified threats to the extent that the species is considered unlikely to occur in the subject land.
Dillwynia glaucula Michelago Parrot-pea	Endangered	-	Occurs on exposed patches of clay or on rocky outcrops in eucalypt woodland often dominated by Scribbly Gum (*Eucalyptus rossii*), Snow Gum (*E. pauciflora*), Broad-leafed Peppermint (*E. dives*) and Red Stringybark (*E. macrorhyncha*). The understorey may be either grassy or shrubby. Grows adjacent to Natural Temperate Grassland in the Michelago area.	No – surveyed	Targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). The Michelago Parrot-pea was not detected. In addition, the species has not been recorded within 10 km of the subject land (Figure 9) and was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the species is considered unlikely to occur in the subject land.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
Diuris aequalis Buttercup Doubletail	Endangered	Vulnerable	This species has been recorded in forest, low open woodland with a grassy understorey, and secondary grassland on the higher parts of the Southern and Central Tablelands (especially on the Great Dividing Range). Populations tend to contain few, scattered individuals; despite extensive surveys, only about 200 plants from 20 populations are known. The species has been recorded in Kanangra-Boyd National Park, Gurnang State Forest, towards Wombeyan Caves, the Taralga - Goulburn area, and the ranges between Braidwood, Tarago and Bungendore. The TBDC lists '*vegetation clearing for agricultural purposes'*, '*overabundant native herbivores'*, '*feral pigs'*, '*overgrazing by domestic stock'*, '*rabbits*', and '*invasive grasses*' as some of the primary threats to the species.	No – habitat degraded, surveyed	Approximately 89% of the original woody vegetation across the subject land has been historically cleared and the groundstorey largely consists of exotic grasses and bare, disturbed ground (Figure 6). The subject land has been heavily grazed over an extended period by stock and is currently subject to heavy grazing from native herbivores and exotic pests such as Fallow Deer and European Rabbit. There is also widespread evidence of rooting by feral pigs. As such, the habitat in the subject land has been substantially degraded by identified threats to the extent that the species is considered unlikely to occur in the subject land. In addition, targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). The Buttercup Doubletail was not detected. Finally, the species has not been recorded within 10 km of the subject land (Figure 9) and was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the species is considered unlikely to occur in the subject land.
Dodonaea procumbens Creeping Hop-bush	Vulnerable	Vulnerable	This species grows in Natural Temperate Grassland or fringing eucalypt woodland of Snow Gum. It is found in open bare patches where there is little competition from other species, on sandy-clay soils, usually on or near vertically-tilted shale outcrops. The species does not persist in heavily grazed pastures of the Monaro. The BAM Calculator lists 'Cooma-Monaro Shire south of Michelago' as a Geographic limitation for this species.	No – geographic limitation, surveyed	The subject land is not in the Lake Bathurst area and is not in the Cooma-Monaro Shire south of Michelago. Conclusion - the geographic limitation removes Creeping Hop-bush as a candidate species credit species.
Eucalyptus pulverulenta Silver-leafed Gum	Vulnerable	Vulnerable	This species grows in shallow soils as an understorey plant in open forest, typically dominated by Brittle Gum (*E. mannifera*), Red Stringybark (*E. macrorhynca*), Broad-leafed Peppermint (*E. dives*), Silvertop Ash (*E. sieberi*) and Apple Box (*E. bridgesiana*). The BAM Calculator lists '*South of Tinderry Range*' as a geographic limitation for this species.	No – geographic limitation	The subject land is not south of Tinderry Range. Conclusion - the geographic limitation removes Silver-leafed Gum as a candidate species credit species.
Heleioporus australiacus Giant Burrowing Frog	Vulnerable	Vulnerable	This species appears to exist as two distinct populations: a northern population largely confined to the sandstone geology of the Sydney Basin and extending as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. The species if found in heath, woodland, and open dry sclerophyll forest on a variety of soil types except those that are clay based. 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 species 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. The TBDC lists '*Habitat loss through clearing for residential, agricultural and urban infrastructure development*', '*Disease (chytrid fungus)*', and '*Reduction of water quality generally in the vicinity of urban development'* as some of the key threats to the species.	No – microhabitat features	The subject land does not contain 'hanging swamps on the top of sandstone plateaus and deeply dissected gullies' and the species has not been recorded within 10 km of the subject land (Figure 9). Conclusion - the subject land lacks the primary microhabitat feature required to support this species and the species is therefore considered unlikely to occur in the subject land.
Hieraaetus morphnoides Little Eagle (Breeding)	Vulnerable	-	This species occupies open eucalypts forest, woodland, or open woodland. Sheoak or *Acacia* 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 lists *'Nest trees - live (occasionally dead) large old trees within vegetation'* as a breeding habitat constraint for this species.	No – surveyed	Targeted bird surveys and random meander surveys were conducted across the subject land in the areas of more intact woody vegetation (Section 2.3.4.2, Figure 11). Mature, remnant trees were also assessed for the presence/absence of habitat features and for signs of fauna nesting in large stick nests (Figure 8, Figure 11). No Little Eagles or large stick nests were recorded in the subject land. Conclusion - the species is considered unlikely to breed in the subject land.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
Lathamus discolor 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 *Eucalyptus globulus*. The TBDC lists *'as per mapped areas'* as a breeding habitat constraint for this species.	No – habitat constraint	The subject land and wider study area are not identified as an 'important area' for Swift Parrot on the 'BAM – Important Areas' map[28]. Conclusion – the subject land lacks the breeding habitat constraints required for this species.
Leucochrysum albicans var. tricolor Hoary Sunray	-	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	Targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). Hoary Sunray was not detected Conclusion - the species is considered unlikely to occur in the subject land.
Lophoictinia isura Square-tailed Kite (Breeding)	Vulnerable	-	This species is found in a variety of timbered habitats including dry woodlands and open forests. It shows a particular preference for timbered watercourses. Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. The TBDC lists *'nest trees'* as a breeding habitat constraint. The TBDC general notes state '*it will be difficult to identify a Kite nest (there are lots of comparable sized stick nests built by other species), especially given Kites have large territories and other stick nesters will undoubtedly also be nesting where Kites might be recorded. Kites will need be in attendance to confirm breeding sites*.'	No – habitat degraded, surveyed	The subject land lacks timbered habitats as approximately 89% of the original woody vegetation has been cleared (Figure 6). In particular, the watercourses which pass through the subject land are not timbered. As such, the subject land lacks the primary breeding microhabitat features and has been degraded to the extent that the species is unlikely to utilise the subject land for breeding. In addition, targeted bird surveys and random meander surveys were conducted across the subject land in the areas of more intact woody vegetation (Section 2.3.4.2, Figure 11). Mature, remnant trees were also assessed for the presence/absence of habitat features and for signs of fauna nesting in large stick nests (Figure 8, Figure 11). No Square-tailed Kites were recorded in the subject land. Finally, the species has not been recorded within 10 km of the subject land (Figure 9) and was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the species is considered unlikely to breed in the subject land.
Miniopterus orianae oceanensis 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, *'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 >500.'*	No – habitat constraint	The subject land does not contain potential breeding habitat (caves, tunnels, mines, culverts, etc.). Conclusion - the subject land lacks the breeding habitat constraints required for this species.
Myotis macropus 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/stretches 3 m wide or greater[29]), where it catches aquatic insects and small fish with their large hind claws, and also catches flying insects. The TBDC lists *'hollow bearing trees within 200 m of riparian zone'*, *'bridges, caves or artificial structures within 200 m of riparian zone'*, and '*waterbodies; this include rivers, creeks, billabongs, lagoons, dams and other waterbodies on or within 200m of the site'* as habitat constrains for this species.	No – surveyed	As detailed in Section 2.3.4.2, two Anabat® detectors were deployed over three nights on 16-18 November 2018 and over 9 nights on 28 November 2019 – 6 December 2019 (Figure 14). The Anabat® detectors deployed from 28 November 2019 to 6 December 2019 were located within the two main patches of identified potential Southern Myotis habitat for a total of 18 trap nights (Figure 14). No Southern Myotis were detected (Appendix E). Conclusion - the species is considered unlikely to occur in the subject land.

[28] https://webmap.environment.nsw.gov.au/Html5Viewer291/index.html?viewer=BAM_ImportantAreas

[29] 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
Ninox connivens 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 – surveyed	A tree habitat assessment identified eight trees with a hollow greater than 20 cm (Appendix C). All eight trees were the focus of stag-watching and spotlighting surveys over two nights (Figure 12). As detailed in Section 2.3.4.2, no Barking Owls were seen or heard in the subject land and no sign of Barking Owls nesting in tree hollows was detected. Conclusion - the species is considered unlikely to breed in the subject land.
Ninox strenua 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 – surveyed	A tree habitat assessment identified eight trees with a hollow greater than 20 cm (Appendix C). All eight trees were the focus of stag-watching and spotlighting surveys over two nights (Figure 12). As detailed in Section 2.3.4.2, no Powerful Owls were seen or heard in the subject land and no sign of Powerful Owls nesting in tree hollows was detected. Conclusion - the species is considered unlikely to breed in the subject land.
Petauroides volans Greater Glider	-	Vulnerable	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, and is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	No – microhabitat features	The subject land does not support tall, montane, or moist eucalypt forest with relatively old trees and abundant hollows, nor does it support a particularly high diversity of eucalypts species. The subject land therefore lacks the primary microhabitat features required to support the species. Finally, the species was not seen or heard during stag-watch surveys (Section 2.3.4.2, Figure 12), spotlighting surveys (Section 2.3.4.2, Figure 12), or previous ecological investigations of the study area (Ecological Australia 2010) and has not been recorded within 10 km of the subject land (Figure 9). Conclusion – the species is considered unlikely to occur in the subject land.
Petaurus norfolcensis 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, surveyed	Approximately 89% of the subject land has been historically cleared (Figure 6). As a result, the spacing between remnant trees is large, canopy cover is very low, and the habitat is fragmented. In addition, the midstorey and shrubstorey are absent across the majority of the subject land (Appendix A and Appendix B). A tree habitat assessment identified only 19 trees with at least one functional hollow; these trees were the focus of stag-watching and spotlighting surveys over two nights (Figure 12). Squirrel Gliders were not seen or heard during these surveys. In addition, the species has not been recorded within 10 km of the subject land (Figure 9) and was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the subject land lacks the primary microhabitat features required for this species and the habitat is degraded to the extent that the species is unlikely to occur in the subject land.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
Phascogale tapoatafa 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 – habitat degraded, surveyed	The subject land does not support heath, swamps, rainforest, or wet sclerophyll forest and approximately 89% of the original woody vegetation (overstorey, midstorey, and shrubstorey) has been historically cleared (Figure 6). A tree habitat assessment identified only 19 trees with at least one functional hollow; these trees were the focus of stag-watching and spotlighting surveys over two nights (Figure 12). Brush-tailed Phascogales were not seen or heard during these surveys. In addition, the species has not been recorded within 10 km of the subject land (Figure 9) and was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the subject land lacks the primary microhabitat features required for this species and the habitat is degraded to the extent that the species is unlikely to occur in the subject land.
Phascolarctos cinereus Koala (Breeding)	Vulnerable	Vulnerable	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 *'areas identified via survey as important habitat'* as a habitat constraint for breeding for this species. 'Important habitat' is defined in TBDC by the density of Koalas and quality of habitat as determined by on-site survey.	No – habitat constraint	Approximately 89% of the subject land has been historically cleared (Figure 6). As a result, the remaining vegetation is largely isolated and fragmented and the midstorey and shrubstorey are largely absent. In addition, despite being conspicuous when present, no Koalas or signs of Koala presence were detected during the tree habitat assessment, fauna nesting survey, multiple other surveys (e.g. plot/transects, threatened flora and bird surveys, threatened nocturnal fauna surveys), or by previous targeted surveys (EcoLogical Australia 2010). The degraded vegetation and lack of Koala observations indicates that the subject land could not be classified as 'important habitat' for breeding. Conclusion - the species is considered unlikely to breed in the subject land.
Pomaderris pallida Pale Pomaderris	Vulnerable	Vulnerable	This species usually grows in shrub communities surrounded by Brittle Gum (*Eucalyptus mannifera*) and Red Stringybark (*E. macrorhyncha*) or *Callitris* spp. woodland.	No – surveyed	Targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). Pale Pomaderris was not detected. The species was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the species is considered unlikely to occur in the subject land.
Potorous tridactylus Long-nosed Potoroo	Vulnerable	Vulnerable	In NSW, the species is generally restricted to coastal heaths and forests east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. The species inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The fruit-bodies of hypogeous (underground-fruiting) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. The species is mainly nocturnal, hiding by day in dense vegetation - however, during the winter months animals may forage during daylight hours.	No – microhabitat features	The subject land is not east of the Great Dividing Range and does not support coastal heaths, wet sclerophyll forests, grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. The subject land therefore lacks the primary microhabitat features required to support the species. Finally, the species was not seen or heard during stag-watch surveys (Section 2.3.4.2, Figure 12), spotlighting surveys (Section 2.3.4.2, Figure 12), or previous ecological investigations of the study area (Ecological Australia 2010) and has not been recorded within 10 km of the subject land (Figure 9). Conclusion – the species is considered unlikely to occur in the subject land
Pteropus poliocephalus 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 habitat constraint for this species.	No – habitat constraint	Approximately 89% of the subject land has been historically cleared (Figure 6). As a result, the subject land does not contain large areas of vegetation with a dense canopy. A tree habitat assessment and multiple other surveys did not record any evidence of current or historic roosting camps, nor is a roosting camp known to occur near the subject land (Section 2.3.4.2, Figure 8, Figure 10, Figure 11, Figure 12). The species was also not detected during spring surveys completed by Ecological Australia (2010). Conclusion - the species is considered unlikely to breed in the subject land.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
Rutidosis leptorrhynchoides Button Wrinklewort	Endangered	Endangered	This species occurs in Box-Gum Woodland, secondary grassland derived from Box-Gum Woodland, or in Natural Temperate Grassland. It often occurs in the ecotone between Box-Gum Woodland and Natural Temperate Grassland. The species grows on soils that are usually shallow, stony red-brown clay loams and tends to occupy areas where there is relatively less competition from herbaceous species (either due to the shallow nature of the soils, or at some sites due to the competitive effect of woodland trees). It exhibits an ability to colonise disturbed areas (e.g. vehicle tracks, bulldozer scrapings and areas of soil erosion). The species is apparently susceptible to grazing, being retained in only a small number of populations on roadsides, rail reserves, and other un-grazed or very lightly grazed sites. Some of the main threats to this species listed in the TBDC are: 1) loss and degradation of habitat and/or populations by intensification of grazing regimes; 2) loss and degradation of habitat and/or populations by invasion of weeds; and 3) increased competition from other native grassland species within the habitat because of adverse increases of biomass due to absence of fire or grazing and the resultant closing up of the inter-tussock spaces that this species requires.	No – surveyed	Targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). Button Wrinklewort was not detected. The species was also not detected during targeted spring surveys completed by Ecological Australia (2010). Finally, the species is susceptible to grazing; the subject land has been heavily grazed over an extended period by stock and is currently subject to heavy grazing from native herbivores and exotic pests such as Fallow Deer and European. Conclusion - the species is considered unlikely to occur in the subject land.
Swainsona recta Small Purple-pea	Endangered	Endangered	Before European settlement Small Purple-pea occurred in the grassy understorey of woodlands and open-forests dominated by Blakely's Red Gum *E. blakelyi*, Yellow Box *E. melliodora*, Candlebark Gum *E. rubida*, and Long-leaf Box *E. goniocalyx*. It grows in association with understorey dominants that include Kangaroo Grass *Themeda australis*, Poa tussocks *Poa* spp. and Speargrasses *Austrostipa* spp.. Some of the main threats to this species listed in the TBDC are: 1) grazing and trampling by cattle, sheep and goats; and 2) loss, degradation and fragmentation of habitat and/or populations for residential developments, agricultural developments, and by weed invasion (including exotic grasses mostly, as well as bridal creeper and St John's wort).	No – habitat degraded, surveyed	Approximately 89% of the climax vegetation has been historically cleared across the subject land (Figure 6). The vegetation which remains is mostly exotic and dominated by a variety of weeds, including a number of noxious grass weeds and St John's Wort (Appendix A and Appendix B). The subject land has been heavily grazed over an extended period by stock and is currently subject to heavy grazing from native herbivores and exotic pests such as Fallow Deer and European Rabbit. In addition, targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). Small Purple-pea was not detected. Finally, the species was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the species is considered unlikely to occur in the subject land.
Swainsona sericea Silky Swainson-pea	Vulnerable	-	This species is found in Natural Temperate Grassland and Snow Gum *Eucalyptus pauciflora* Woodland on the Monaro, and in Box-Gum Woodland in the Southern Tablelands and South West Slopes. It is sometimes found in association with Cypress-pines *Callitris* spp.. Some of the main threats to this species listed in the TBDC are loss and degradation of habitat and/or populations for: 1) residential developments; 2) invasion of weeds; 3) intensification of grazing regimes; and 4) agricultural developments.	No – habitat degraded, surveyed	Approximately 89% of the climax vegetation has been historically cleared across the subject land (Figure 6). The vegetation which remains is mostly exotic and dominated by a variety of weeds, including a number of noxious weed species (Appendix A and Appendix B). The subject land has been heavily grazed over an extended period by stock and is currently subject to heavy grazing from native herbivores and exotic pests such as Fallow Deer and European Rabbit. In addition, targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). Silky Swainson-pea was not detected. Finally, the species was also not detected during targeted spring surveys completed by Ecological Australia (2010). Conclusion - the species is considered unlikely to occur in the subject land.

Species	NSW (BC Act) listing status	National (EPBC Act) listing status	Habitat requirements	Presence	Justification for exclusion
Synemon plana Golden Sun Moth	Endangered	Critically Endangered	This species occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the groundlayer is dominated by Wallaby Grasses *Rhytidosperma* spp.. Grasslands dominated by Wallaby Grasses are typically low and open and the bare ground between the tussocks is thought to be an important microhabitat feature for species as it is typically these areas on which the females are observed displaying to attract males. Habitat may contain several Wallaby Grass species, which are typically associated with other grasses particularly Speargrasses *Austrostipa* spp. or Kangaroo Grass *Themeda triandra*. The TBDC lists Wallaby Grasses *Rytidosperma* spp., Chilean Needlegrass *Nassella nessiana* or Serrated Tussock *Nassella trichotoma* as a habitat constraint and the BAM Calculator lists '*not east of Lake George Escarpment or Great Dividing Range*' as a geographic limitation. The TBDC also lists overgrazing by domestic stock and invasive grasses as some of the primary threats to the species. Finally, The ACT Government Action Plan[30] details the following pertinent points with respect to the occurrence of the Golden Sun Moth in the ACT and surrounds. • Occupied sites are generally flat or gently sloping and shading of habitat is generally minimal. • Occupied sites tend to be open grasslands dominated by tussocks of Wallaby Grasses, and to a lesser extent Tall Speargrass and Kangaroo Grass, that are generally low to moderate in grass height and have a moderate to high grass cover with areas of bare ground (inter-tussock space). • Populations in open woodland and secondary grassland are likely be the result of the species spreading outside its preferred habitat (Natural Temperate Grassland). • Males are unlikely to fly more than 100 m away from suitable habitat and females even less distance. Populations separated by 200 m are therefore likely to be isolated and are treated as separate sites.	No – habitat degraded, microhabitat features	Natural Temperate Grassland is the preferred habitat of the Golden Sun Moth. Whilst the species is also known to occur in Box-Gum Woodland and grassland/pasture which was formerly Box-Gum Woodland, this usually occurs only within a limited distance of the historical extent of Natural Temperate Grassland. Before European settlement, the whole of the study area would have been characterised by woody PCTs (Figure 6). Indeed, all of the vegetation which falls within the 1500 m buffer to the study area is estimated to have historically comprised woody PCTs (Figure 5). The nearest known area of Natural Temperate Grassland, which also corresponds to the nearest Golden Sun Moth record (Figure 9), is approximately 4.5 km to the west of the study area (i.e. in the Queanbeyan Nature Reserve). The nearest modelled area of pre-European Natural Temperate Grassland[31] is 4.5 km to the west of the study area, 5 km to the north-east, and 5.5 km to the south (Figure 5). The land between the known/modelled extent of Natural Temperate Grassland and the study area is largely characterised by urban development or dry sclerophyll forest, both of which do not constitute appropriate Golden Sun Moth habitat (Figure 5). As such, it is highly unlikely that Golden Sun Moths have been able to colonise the study area by dispersing from occupied habitat over 4 km away through such large expanses of non-habitat. In addition, approximately 89% of the vegetation across the subject land has been historically cleared and what remains is severely degraded (Figure 6). The groundstorey is largely bare (i.e. there is low grass cover) and dominated by exotic grasses and forbs (Appendix A and Appendix B). The areas which do support a native groundstorey also support a moderately dense canopy, thereby making those areas characteristically unsuitable Golden Sun Moth habitat. Wallaby Grasses, the primary natural food species for the Golden Sun Moth, were recorded in only 25% of plots, with a low average cover of 1.5% (Appendix B). The subject land is characterised by hills and gullies and could not be described as 'generally flat or gently sloping'. In summary, the subject land does not contain the microhabitat features required to support the Golden Sun Moth. Finally, the open grassy habitat in the study area was surveyed by EcoLogical Australia (2010) and during the numerous surveys completed by Capital Ecology during October to December 2018 and 2019. No Golden Sun Moths have ever been detected despite the very large number of hours spent 'on site' during appropriate survey conditions. Conclusion - the subject land lacks the primary microhabitat features required for this species and the habitat is degraded to the extent that the species is unlikely to occur in the subject land.
Zieria citriodora Lemon Zieria	Endangered	Vulnerable	The species is known from two sites in NSW - Numerella and Kybean Trig - east of Cooma. Lemon Zieria grows in low woodland of *E. mannifera* - *E. macrorhyncha* - *E. dives* with a shrub understorey.	No – surveyed	Targeted threatened flora transect surveys and random meander surveys through potential habitat were conducted across the subject land during the development of this BDAR (Section 2.3.4.2, Figure 10). Lemon Zieria was not detected. In addition, the species has not been recorded within 10 km of the subject land (Figure 9) and was also not detected during targeted spring surveys completed by EcoLogical Australia (2010). Conclusion - the species is considered unlikely to occur in the subject land.

[30] ACT Government (2017). *Golden Sun Moth Synemon plana Action Plan.* In: ACT Government (2017). *ACT Native Grassland Conservation Strategy and Action Plans*. (Environment, Planning and Sustainable Development, Canberra).
[31] Spatial data developed by Rehwinkel (1999). *Natural Temperate Grassland of the Southern Tablelands: modelled distribution prior to European settlement*.

2.3.4.2 BAM targeted survey results

As described in Table 16, 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 PCTs of the subject land.

Threatened flora

A total of 148 flora species were recorded in the study area, comprising 100 native species and 48 exotic species (Appendix B).

Whilst not detected during the targeted threatened flora surveys conducted for this BDAR, EcoLogical Australia (2010) recorded Hoary Sunray *Leucochrysum albicans* var. *tricolor* (EPBC Act endangered) in the study area. These records were restricted to a small number of plants in the higher quality, intact Box-Gum Woodland on the south-western boundary of the study area and three plants in higher quality, intact dry sclerophyll forest on northern boundary of the study area. The large patch of scattered Hoary Sunray identified on Figure 5 of EcoLogical Australia (2010) has since been removed by the development of the Ellerton Drive Extension. EcoLogical Australia (2010) did not record any Hoary Sunray plants within the boundary of subject land as defined in this BDAR.

In light of the above, extensive field surveys confirmed that no threatened flora species occur in the subject land but, as indicated by EcoLogical Australia (2010), the wider study area does support a small number of Hoary Sunray plants.

Threatened birds

A total of 46 bird species were recorded in the study area across all surveys, comprising 43 native species and three exotic species (Appendix D).

As shown in Figure 11, Dusky Woodswallows *Artamus cyanopterus* (BC Act vulnerable) were observed on four occasions (5/11/2018, 16/11/2018, 25/11/2018, and 28/11/2019). On most occasions the species occurred within the higher quality, intact vegetation which borders the Queanbeyan River. On the 16/11/2018 a pair were observed constructing a nest in a dead tree. On all other occasions, individuals were observed flying through and above the canopy.

A Scarlet Robin *Petrocia boodang* (BC Act vulnerable) was observed on the 31/07/2018 foraging in a small patch of intact woodland (Figure 11).

A Diamond Firetail *Stagonopleura guttata* (BC Act vulnerable) was observed on 28/11/2019 flying through a patch of exotic vegetation (Figure 11).

While not detected during the current surveys, EcoLogical Australia (2010) recorded non-breading observations of Gang-Gang Cockatoo *Callocephalon fimbriatum* (BC Act vulnerable), Speckled Warbler *Chthonicola sagittate* (BC Act vulnerable), and Painted Honeyeater *Grantiella picta* (EPBC Act and BC Act vulnerable).

All of the above species are assumed to be present in the subject land as ecosystem credit species (Table 15). Importantly, none of the threatened candidate species credit species identified in Table 16 as having the potential to breed on or around the subject land were observed nesting despite multiple surveys occurring at the appropriate time of year.

In light of the above, it is concluded that the subject land does not support breeding habitat for the relevant species credit species identified in Table 16.

Threatened nocturnal fauna

A total of 13 fauna species were identified during stag-watching surveys and nocturnal fauna surveys, comprising eight native species and five exotic species (Appendix D).

All eight trees identified as supporting functional hollows over 20 cm in size were observed during stag-watching surveys for one hour from dusk on 28 November 2019 or 28 January 2020 (Figure 12). Listening for vocalizations of nocturnal fauna was also undertaken during stag-watching surveys. Fauna recorded exiting hollows during stag-watching surveys was limited to the Common Brushtail Possum *Trichosurus vulpecula* and unidentified microbats.

Potential habitat, consisting primarily of patches of intact remnant vegetation, were surveyed for threatened nocturnal fauna surveys on 28 November 2019 and 28 January 2020 (Figure 12). Particular attention was given to the patches of remnant vegetation containing hollow bearing trees. Listening for vocalisations of nocturnal fauna was also undertaken during the spotlight surveys. Native fauna recorded during threatened nocturnal fauna surveys was limited to Common Eastern Froglet *Crinia signifera*, Spotted Marsh Frog *Limnodynastes tasmaniensis*, Lesueur's Tree-frog *Litoria lesueurii*, Eastern Grey Kangaroo, Common Brushtail Possum, Common Wombat *Vombatus ursinus*, and unidentified microbats. Exotic species recorded during threatened nocturnal fauna surveys was limited to Rusa Deer *Rusa timorensis*, Fallow Deer, and European Rabbit.

In light of the above, it is concluded that the subject land does not support habitat for the relevant nocturnal species credit species identified in Table 16.

Pink-tailed Legless Lizard

No Pink-tailed Legless Lizard *Aprasia parapulchella*, or any other threatened species, were detected during the survey (Figure 13[32]). Surveys at a nearby site in Googong, NSW on the 19/09/2018 detected Pink-tailed Legless Lizard, indicating that the time of survey for this BDAR was appropriate to reliably detect the species if present.

In addition to many scorpions, spiders, centipedes and other common invertebrates, a number of non-target herpetofauna species were recorded during the survey, including Three-toed Skink *Hemiergis decresiensis*, Delicate Skink *Lampropholis delicata*, Common Eastern Froglet, Eastern Banjo Frog *Limnodynastes dumerilii*, and Spotted Marsh Frog.

In light of the above, it is concluded that the subject land does not support the Pink-tailed Legless Lizard.

Threatened bats

As detailed in the reports provided by Fly By Night Bat Surveys Pty Ltd (received from Glenn Hoye on 9 December 2018 and 26 January 2020, Appendix E), insectivorous bats were recorded at each survey location on each survey night (Figure 14). A total of 489 passes were analysed from the 2018 Anabat® recordings and 1,212 from the 2019 Anabat® recordings.

[32] Note that the survey tracks presented in Figure 13 only show the path of one of the three ecologists. In general, the three ecologists involved in the survey were separated by 10 – 50 m. Therefore, in order to better reflect survey coverage, a buffer of 25 m has been applied to the recorded survey track.

In combination (i.e. considering both the 2018 and 2019 Anabat® recordings together), the following 10 species were identified with confidence:

- White-striped Mastiff Bat *Austronomus australis*;
- Southern Freetail Bat *Mormopterus planiceps*;
- Gould's Wattled Bat *Chalinolobus gouldii*;
- Chocolate Wattled Bat *Chalinolobus morio*;
- Eastern False Pipistrelle *Falsistrellus tasmaniensis*[33] (BC Act vulnerable)
- Large Bent-winged Bat *Miniopterus orianae aceanensis*[34] (BC Act vulnerable);
- Eastern Freetail Bat *Mormopterus ridei;*
- Unidentified Long-eared Bat *Nyctophilus* sp.
- Large Forest Bat *Vespadelus darlingtonia*; and
- Little Forest Bat *Vespadelus vulturnus.*

The occurrence of the following additional species is considered 'probable' based on the calls recoded:

- Southern Forest Bat *Vespadelus regulus*

None of the above species are listed pursuant to the EPBC Act, however the Eastern False Pipistrelle and Large Bent-winged Bat are listed as vulnerable pursuant to the BC Act. Both species are identified as ecosystem credit species (foraging) and the Large Bent-winged Bat as a species credit species (breeding). As detailed in Table 16, the subject land does not support potential Large Bent-winged Bat roosting and/or breeding habitat (caves, mines, water tunnels, etc.).

As outlined in Section 2.2.3.6, particular consideration was given to the Southern Myotis (BC Act vulnerable), with two Anabat® detectors located for a total of 18 trap nights within the two main patches of potential Southern Myotis habitat in the subject land (Figure 14). Fly By Night Bat Surveys Pty Ltd, who analysed the Anabat® data, were specifically asked to look for any calls which could be the Southern Myotis. However, no Southern Myotis calls were recorded (Appendix E). As such, the Southern Myotis is considered unlikely to occur in the subject land.

[33] Named in Appendix E as Eastern Falsistrelle *Falsistrellus tasmaniensis.*
[34] Previously known, and named in Appendix E, as the Eastern Bent-wing Bat *Miniopterus schreibersii oceanensis*.

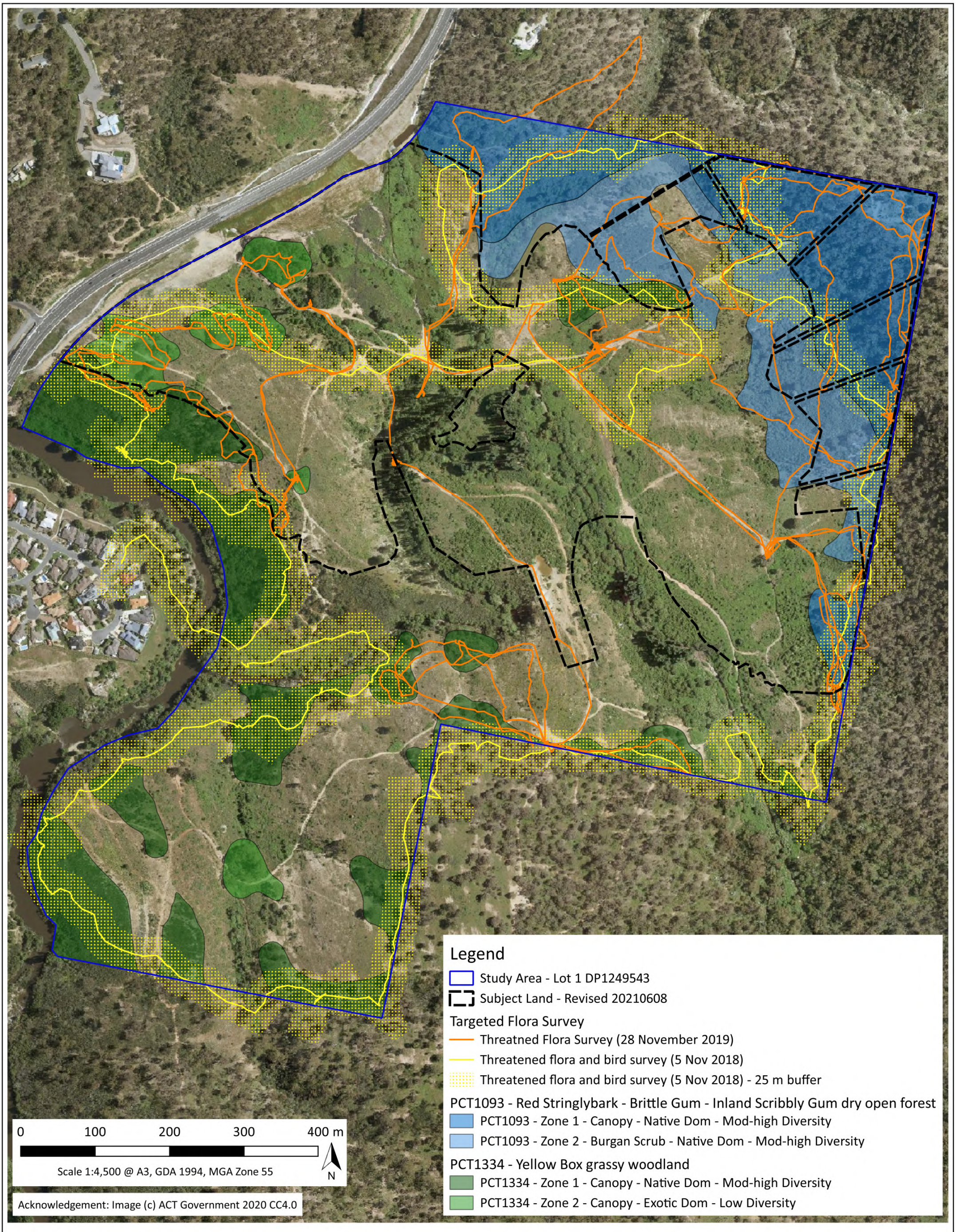

Figure 10. Threatened Flora Survey

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

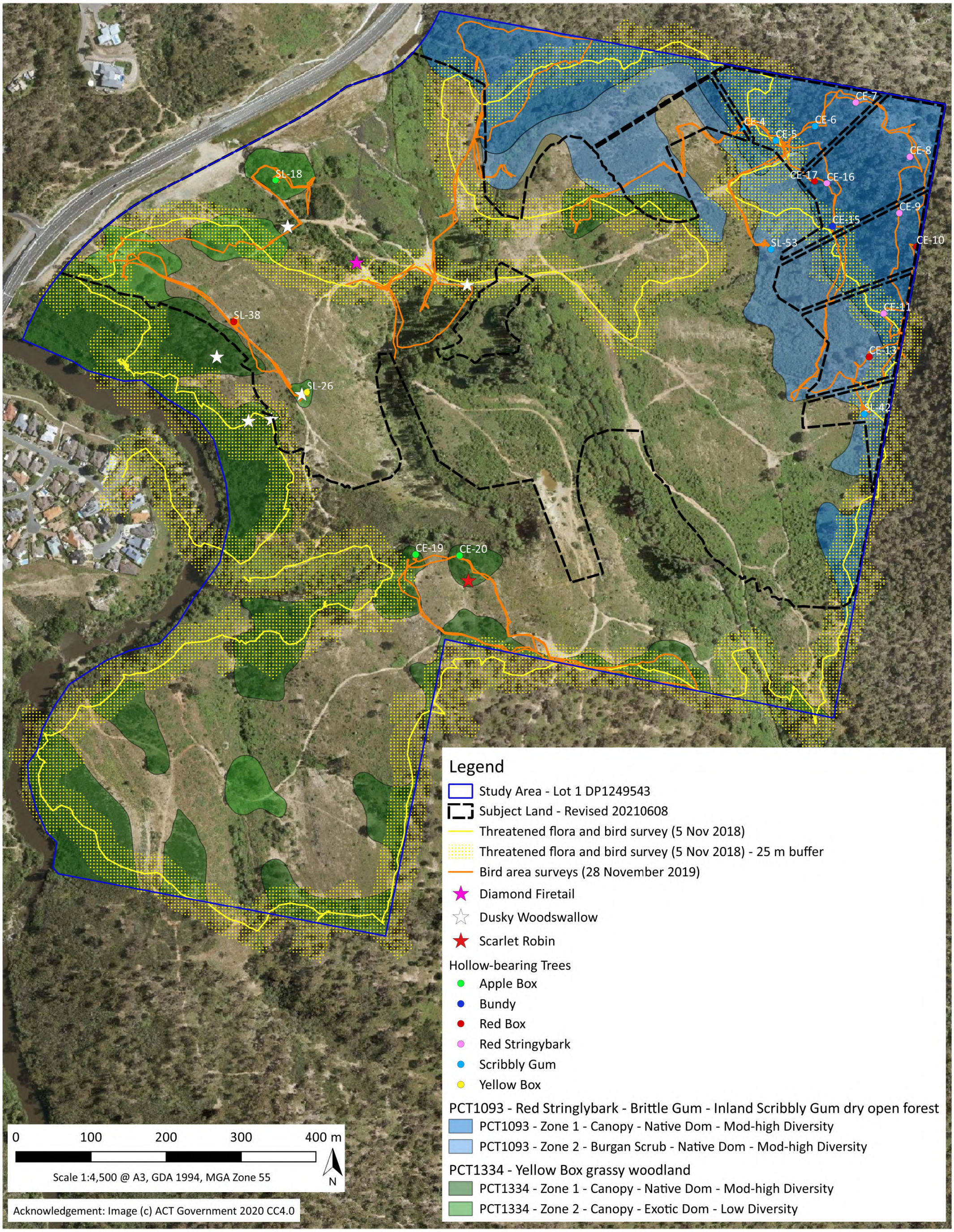

Figure 11. Threatened Bird Surveys

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

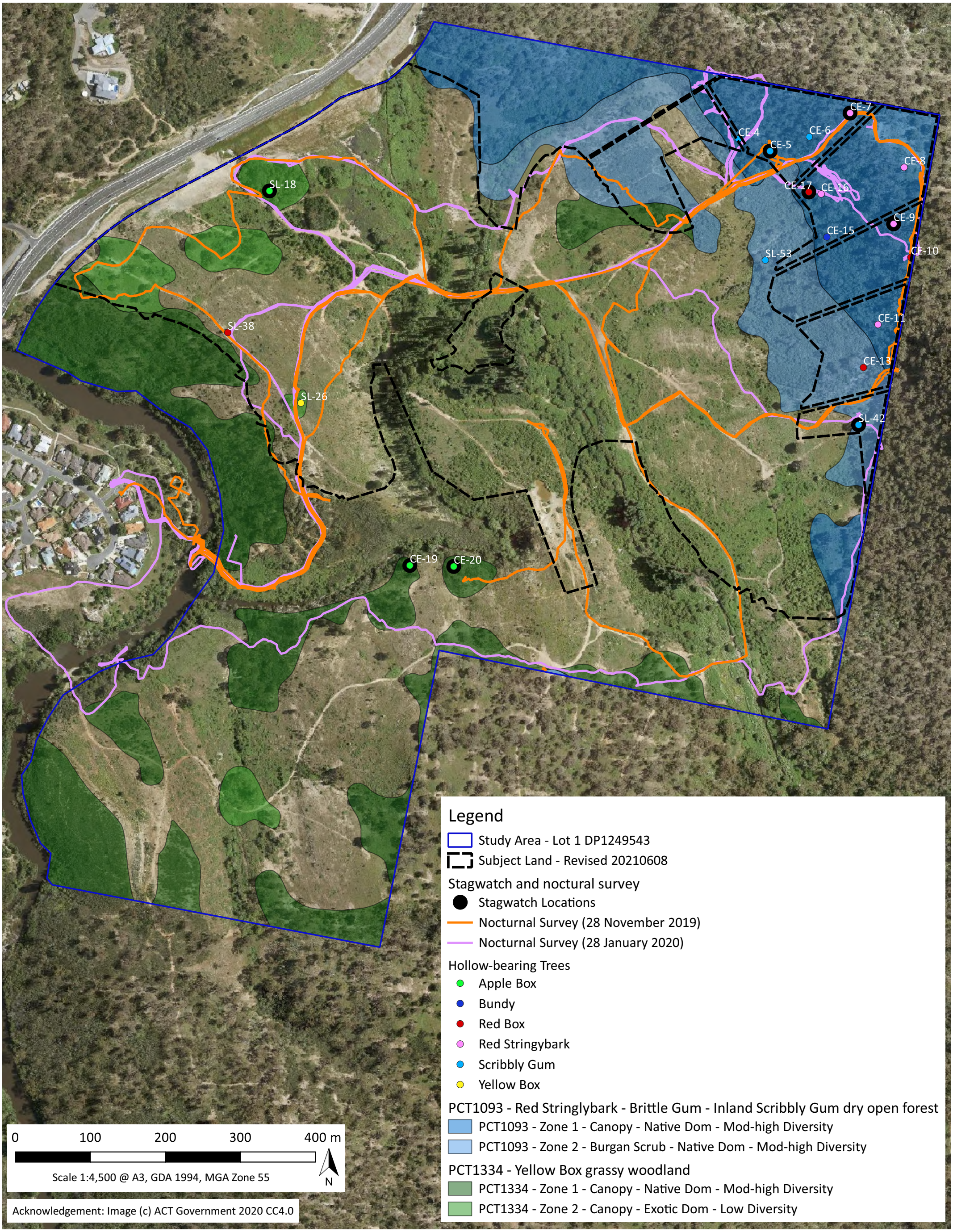

Figure 12. Stag-watch and Threatened Nocturnal Fauna Survey

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

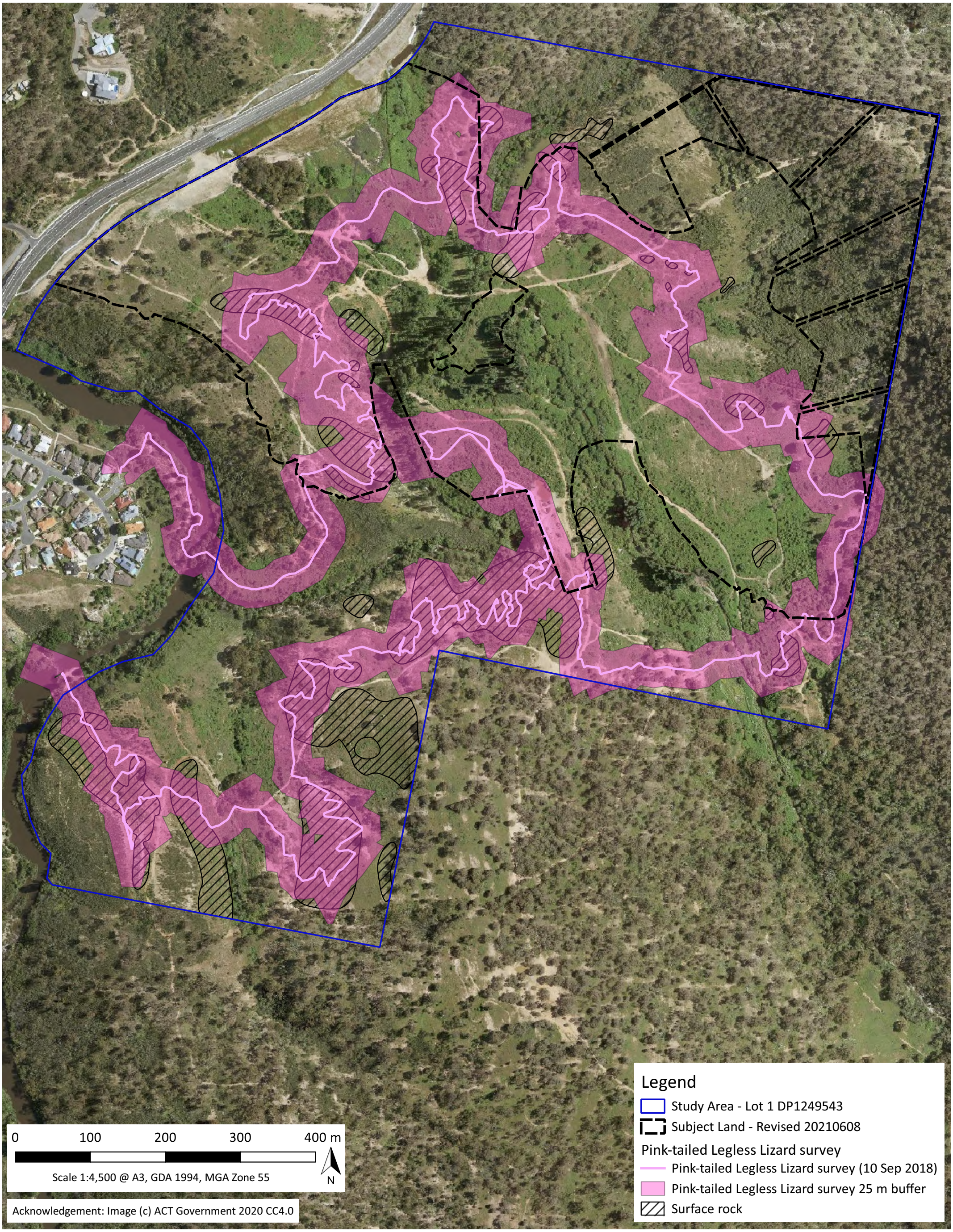

Figure 13. Pink-tailed Legless Lizard Surveys

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

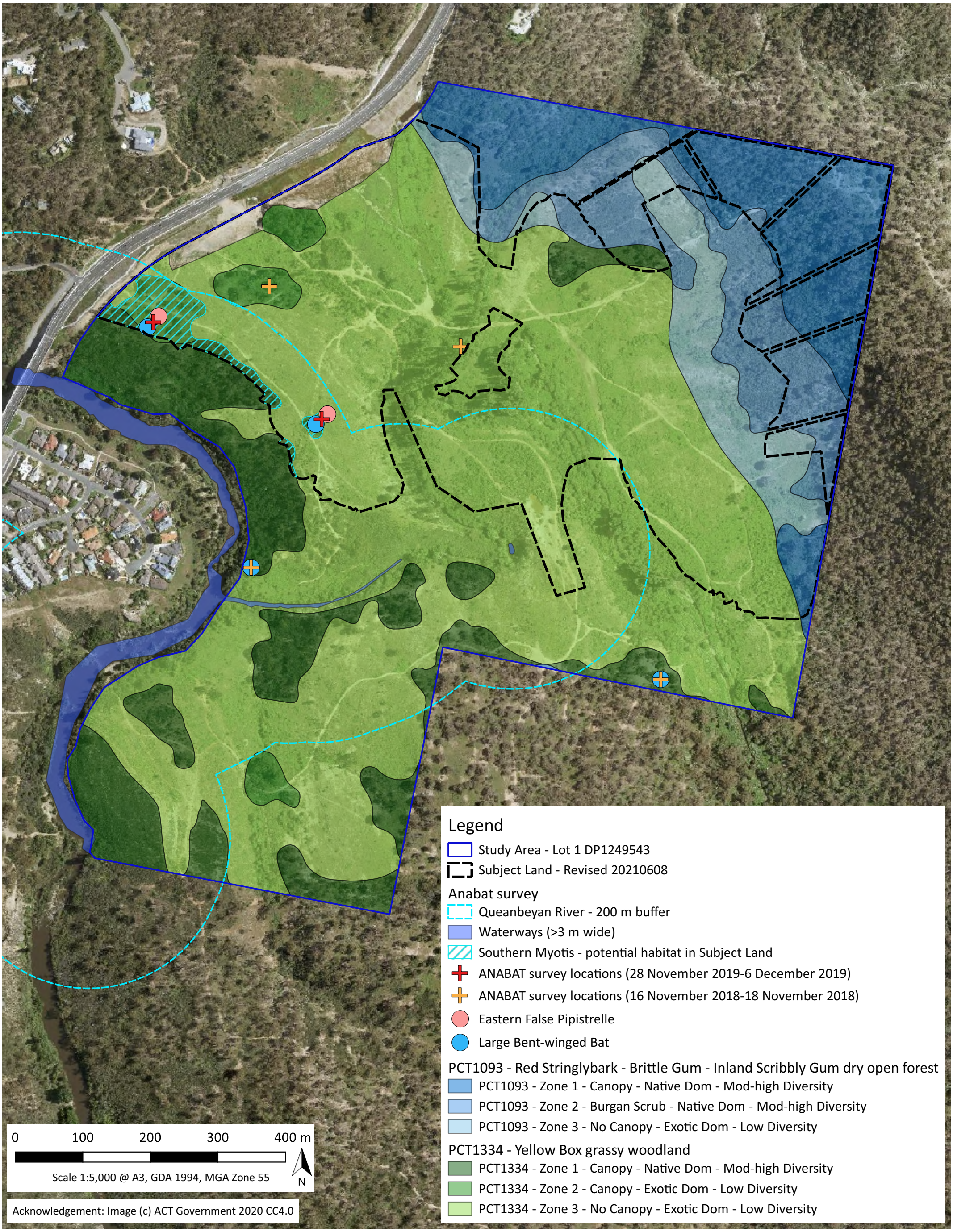

Figure 14. Anabat Threatened Bat Survey

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

Part 2 – Impact Assessment (BAM Stage 2)

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 Chapter 8 of 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 proposed development.

3.1.1 Avoiding and minimising impacts on native vegetation and habitat

3.1.1.1 Location

As described in detail below, many of the potential impacts associated with the proposed development have been avoided and minimised through location. As per Chapter 8 of the BAM, the following principles have been enacted to avoid and minimise impacts to native vegetation and habitat.

Locating the project in areas where there are no biodiversity values

The development of Jumping Creek Estate has been under consideration since the early 2000s. One of the key reasons that the study area (i.e. Lot 1 DP1249543, Queanbeyan, NSW) was selected as the location for the proposed development was the informed knowledge that the area lacks significant biodiversity values. This is because the study area has been heavily modified by its history of varying land uses, including mining, quarrying, and grazing/agriculture. More recently, the study area has been impacted by additional human activities (e.g. off-road vehicles and rubbish dumping) and by ongoing key threatening processes (e.g. invasive plants and animals). These historic activities and ongoing impacts have substantially degraded the ecological values of the study area to the point where it is now largely dominated by exotic plants and disturbed land and no longer supports significant habitat for threatened flora, fauna, or ecological communities.

As such, the choice of the study area as the location for the proposed development largely avoids impacts on biodiversity values and, as a result, the proposed development only impacts the following.

- 7.24 ha of BC Act native vegetation / habitat. This impact represents 17.8% of the subject land (i.e. proposed development impact area), which is very low given that 100% of the subject land would have supported BC Act native vegetation / habitat before European settlement.
- 4.31 ha of remnant canopy (i.e. PCT1093 Zone 1 and PCT1334 Zones 1 and 2). This represents 10.6% of the subject land, which is very low given that 100% of the subject land would have supported a remnant canopy before European settlement.
- Four hollow bearing trees. This impact likely represents a small fraction of the hollow-bearing trees in the immediate vicinity of the study area.

- One termite mound. This represents 7.1% of the termite mounds in the study area and likely represents a small fraction of the termite mounds in the immediate vicinity of the study area.

Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score)

The design and associated layout of the proposed development has gone through multiple iterations. At each stage, the layout considered biodiversity values and, to the greatest extent practicable, avoided and minimised impacts to those values.

As a result, the proposed development impacts 32.16 ha of heavily degraded vegetation (i.e. PCT1093 Zone 3 and PCT1334 Zone 3). These areas support a high density and diversity of noxious weeds and have been degraded to the extent that they can no longer be considered native vegetation or threatened species habitat. The impact to 32.16 ha of heavily degraded vegetation represents 81.6% of the 39.40 ha of vegetation (native and exotic) cleared by the proposed development; this clearly demonstrates that the proposed development has been located in areas where the native vegetation and threatened species habitat are in the poorest condition.

Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained

As mentioned previously, the proposed development has mainly been located in those areas that have been degraded to the extent that they no longer support native vegetation or threatened species habitat. As such, these areas are unlikely to significantly contribute to connectivity between areas of adjacent or nearby habitat. In addition, as detailed in Section 3.1.1.2, connectivity along riparian corridors and the residual portions of the study area will be enhanced through weed control, feral animal control, and supplementary plantings of PCT appropriate species. Therefore, connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat will not only be maintained but is likely to be enhanced.

3.1.1.2 Design

As described in detail below, many of the potential impacts associated with the proposed development have been avoided and minimised through design. As per Chapter 8 of the BAM, the following principles have been enacted to avoid and minimise impacts to native vegetation and habitat.

Reducing the clearing footprint of the project

As mentioned previously, the proposed development has been located in those areas that have been degraded to the extent that they no longer support native vegetation or threatened species habitat. As such, the clearing footprint has effectively been reduced to a minimum in those vegetation zones that do support native vegetation and habitat. As a result, the proposed development only impacts the following.

- 7.24 ha of BC Act native vegetation / habitat. This impact represents 17.8% of the proposed development impact area (i.e. the subject land), which is very low given that 100% of the subject land would have supported BC Act native vegetation / habitat before European settlement.

- 4.31 ha of remnant canopy (i.e. PCT1093 Zone 1 and PCT1334 Zones 1 and 2). This represents 10.6% of the subject land, which is very low given that 100% of the subject land would have supported a remnant canopy before European settlement.

- Four hollow bearing trees. This impact likely represents a small fraction of the hollow-bearing trees in the immediate vicinity of the study area.

- One termite mound. This represents 7.1% of the termite mounds in the study area and likely represents a small fraction of the termite mounds in the immediate vicinity of the study area.

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

As detailed in the Subdivision Engineering Drawings and Reports (Peet Pty Ltd 2019a)[35], all ancillary facilities will be located on land that will be impacted by the proposed development. These areas correspond to locations of negligible biodiversity value, where the native vegetation or threatened species habitat is in the poorest condition, and/or in areas that avoid habitat for species and vegetation in high threat status categories.

Providing structures to enable species and genetic material to move across barriers or hostile gaps

As mentioned previously, the proposed development has mainly been located in those areas that have been degraded to the extent that they no longer support native vegetation or threatened species habitat. As such, these areas are unlikely to significantly contribute to connectivity between areas of adjacent or nearby habitat. However, the proposed development does include large lots that contain intact vegetation and fauna habitat features (e.g. hollow bearing trees and termite mounds). The boundaries of these large lots will be fenced and therefore have the potential to impede the movement of species and genetic material, especially with respect to terrestrial and arboreal fauna. As detailed in Section 3.3.1, whilst the boundaries of the large lots must be fenced for boundary demarcation purposes, these fences will be simple star picket and three plain wire (i.e. non-barbed wire) design. These measures will avoid or at least greatly minimise any potential impediment to native fauna movement within the study area and through the locality, thereby enabling species and genetic material to move unhindered.

Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation and habitat

The proposed development impacts 40.64 ha of the study area. As such, there is 53.89 ha of residual land. These residual areas support the following biodiversity values (Figure 15).

- 8.30 ha of PCT1093 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation);

- 4.19 ha of PCT1093 Zone 2 – Moderate to high diversity vegetation which lacks an overstorey (BC Act native vegetation);

- 0.62 ha of PCT1093 Zone 3 – Highly modified exotic vegetation;

[35] Peet Pty Ltd (2019a). *Jumping Creek Subdivision 22-03-2019 Peet Pty Ltd*. March 2019. Attached as part of the Jumping Creek Subdivision Development Application.

- 12.28 ha of PCT1334 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation, EPBC Act and BC Act Box-Gum Woodland);
- 0.46 ha of PCT1334 Zone 2 – Native overstorey with a low diversity exotic groundlayer (BC Act native vegetation, BC Act Box-Gum Woodland); and
- 28.05 ha of PCT1334 Zone 3 – Highly modified exotic vegetation.
- At least 15 hollow bearing trees and at least 13 termite mounds.

In total, the residual areas support 25.25 ha of BC Act native vegetation / habitat and 28.67 ha of heavily degraded vegetation (i.e. PCT1093 Zone 3 and PCT1334 Zone 3).

A number of mechanisms and management plans have been incorporated into the proposed development to demarcate, restore/rehabilitate, and maintain the native vegetation and habitat retained in the residual land. These mechanisms and management plans are briefly described below.

Conservation of biodiversity values in residual land

As shown in Figure 2, Figure 3, and Figure 15, the proposed development includes 53.89 ha of residual land (i.e. land that will not be impacted by the proposed development). This 53.89 ha of residual land is mainly located across the southern half of the study area, but also includes a patch in the north of the study area and the portions of the six large lots that are not directly impacted by the proposed development. As described previously, these areas support a variety of ecological values (Figure 15). In order to protect these values, the residual land will be managed in accordance with the Vegetation Management Plan (Soil and Water 2021)[36] and Landscape Management Plan (Peet Pty Ltd 2019b[37], Spiire 2021[38]). In large lots, this will occur under the enforcement of a Section 88B instrument. As outlined in the Vegetation Management Plan and Landscape Management Plan, the residual land will be intensively remediated and managed by the proponents for 3 years. Following this period, the residual land (with the exception of the land in the six large lots) will be vested to Council for long-term management.

The management of the residual land differs depending on the ecological values each area possesses and is described in detail in the Vegetation Management Plan and Landscape Management Plan. In brief, management of residual land includes the following.

- Protection of existing native vegetation. Removal or destruction of native vegetation in residual land will be prohibited, unless otherwise stipulated under other legislation or approvals.
- Protection of existing fauna habitat features. Removal or destruction of fauna habitat features (e.g. hollow bearing trees, termite mounds, woody debris, surface rock, etc.) will be prohibited, unless otherwise stipulated under other legislation or approvals.
- Weed control. Weed control will be achieved through a mix of direct removal, spot spraying, stem injection, and 'cut and dab' techniques. Initial knockdown will occur over the growing months, then ongoing follow-up control annually for the first 3 years to achieve an effective knock-down. Ongoing control will depend on results of a weed monitoring program to

[36] Soil and Water (2021). *Vegetation Management Plan. Greenleigh Housing Development. Jumping Creek NSW.* Version 5, 18 January 2021.
[37] Peet Pty Ltd (2019b). *Jumping Creek Estate Development, Lot 5 DP1199045. Landscape Management Plan*. Rev A, 9 April 2019.
[38] Spiire (2021). *Landscape Master Plan. Jumping Creek Estate Development.* Rev A, 18 June 2021.

address any site-specific outbreaks as they occur but should be at the maintenance level if years 1-3 are undertaken effectively.

- Feral animal control. Feral animals will initially be controlled using a variety of techniques, potentially including poisonous baits, habitat destruction (i.e. ripping warrens), and direct elimination (i.e. shooting).
- Revegetation using PCT appropriate native species across multiple strata. Supplementary plantings in specific areas will occur with an aim to rehabilitate degraded vegetation, increase functional connectivity across the study area, reduce erosion, and improve water quality.
- Establishment of walking trails and fire trials in accordance with a trail management plan. This will help limit unintended impacts from human occupation of the subject land.

3.1.2 Avoiding and minimising prescribed impacts on native vegetation and habitat

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.*

Potential 'prescribed biodiversity impacts' due to the proposed development were identified during the development of this BDAR. As described in the following sections, none of the potential impacts were determined to be a 'prescribed biodiversity impact' due to the fact that they did not impact threatened species habitat or threatened ecological communities in addition to that described in Section 3.2.

Notwithstanding this, the avoidance and minimisation measures detailed in Section 3.1.1 and the mitigation measures detailed in Section 3.3.1 will reduce the impact of the proposed development on the below potential 'prescribed biodiversity impacts'.

3.1.2.1 Rocks

As detailed in Section 2.3.1, Section 2.3.4.2, and shown on Figure 13, the subject land contains substantial patches of loose surface rock, the removal of which is identified as a potential prescribed biodiversity impact. As detailed in Section 2.2.3.2 and 2.3.4.2, a rock turning survey was performed across the subject land and study area in order to determine the value of the loose surface rock to threatened fauna (particularly with respect to Pink-tailed Worm Lizard, the species credit species associated with rock). No threatened fauna were detected. In addition, rocky areas were not associated with patches of Box-Gum Woodland (i.e. PCT1334 Zone 1 and Zone 2, Figure 13), the only threatened ecological community that occurs in the study area.

It is therefore unlikely that the removal of rocks will have a prescribed biodiversity impact.

3.1.2.2 Non-native vegetation

As detailed in Section 2.2.4 and Figure 6, the study area contains substantial patches of non-native vegetation, the removal of which is identified as a potential prescribed biodiversity impact. As detailed in Section 2.2.4, Section 2.2.5, and Table 14 to Table 16, the areas of non-native vegetation do not classify as a threatened ecological community and are not identified as threatened species habitat.

It is therefore unlikely that the removal of non-native vegetation will have a prescribed biodiversity impact.

3.1.2.3 Connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

As mentioned previously, the proposed development has largely been located in areas that have been degraded to the extent that they no longer support native vegetation or threatened species habitat. As such, these areas are unlikely to significantly contribute to the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range. However, the proposed development does include large lots that contain intact vegetation and fauna habitat features (e.g. hollow bearing trees and termite mounds). The boundaries of these large lots will be fenced and therefore have the potential to impede the movement of threatened species across their range. As detailed in Section 3.3.1, whilst the boundaries of the large lots must be fenced for boundary demarcation purposes, these fences will be simple star picket and three plain wire (i.e. non-barbed wire) design. These measures will avoid or at least greatly minimise any potential impediment to native fauna movement within the study area and through the locality, thereby maintaining connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.

It is therefore unlikely that the proposed development will have a prescribed impact on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.

3.1.2.4 Movement of threatened species that maintains their life cycle

As mentioned previously, the proposed development has largely been located in areas that have been degraded to the extent that they no longer support native vegetation or threatened species

habitat. As such, these areas are unlikely to significantly contribute to the movement of threatened species that maintains their life cycle. However, the proposed development does include large lots which contain intact vegetation and fauna habitat features important for breeding (e.g. hollow bearing trees and termite mounds). The boundaries of these large lots will be fenced and therefore have the potential to impact the movement of threatened species that maintains their life cycle. This is particularly relevant for the Rosenberg's Goanna *Varanus rosenbergi* (BC Act vulnerable), a species known lay their eggs in termite mounds. As detailed in Section 3.3.1, whilst the boundaries of the large lots must be fenced for boundary demarcation purposes, these fences will be simple star picket and three plain wire (i.e. non-barbed wire) design. Such fences are unlikely to substantially restrict the movement of the threatened species that occur in the locality, including the Rosenberg's Goanna, and therefore will not impact the movement of threatened species that maintains their life cycle. In addition, as detailed in Section 3.3.1, fences surrounding large lots will be located to avoid all direct impacts to termite mounds and, as detailed in Section 3.1.1.2 and Section 3.3.1, existing fauna habitat features including termite mounds will be protected in all areas not directly impacted by the proposed development.

It is therefore unlikely that the proposed development will have a prescribed impact on the movement of threatened species that maintains their life cycle.

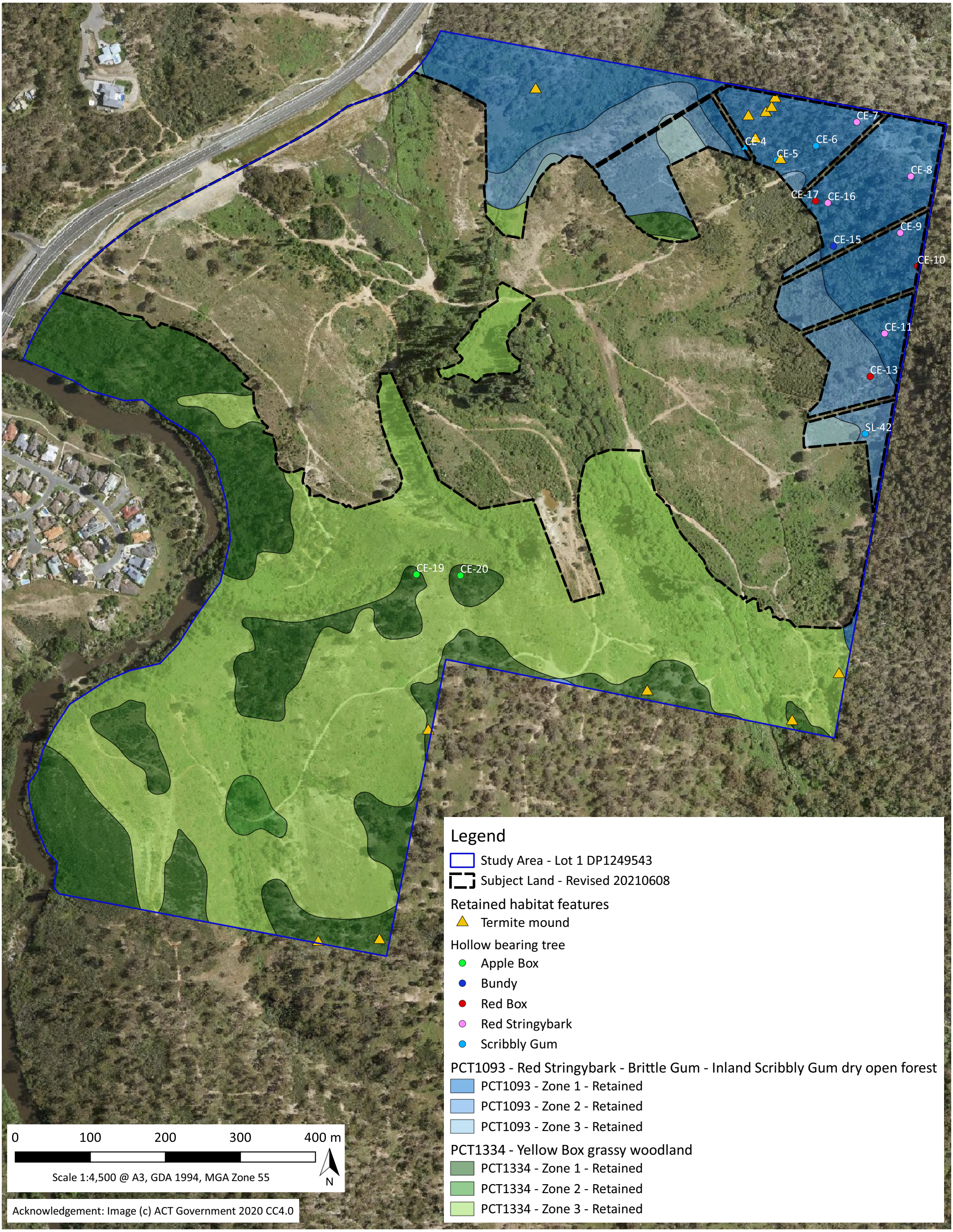

Figure 15. Retained Vegetation and Habitat

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

3.2 Residual Biodiversity Impacts of the Proposed Development

3.2.1 Direct impacts on native vegetation and habitat

As shown in Figure 6 and Figure 16, the proposed development will result in the clearance of:

- 1.48 ha of PCT1093 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation);
- 2.93 ha of PCT1093 Zone 2 – Moderate to high diversity vegetation which lacks an overstorey (BC Act native vegetation);
- 0.85 ha of PCT1334 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation, EPBC Act and BC Act Box-Gum Woodland);
- 1.98 ha of PCT1334 Zone 2 – Native overstorey with a low diversity exotic groundlayer (BC Act native vegetation, BC Act Box-Gum Woodland);
- four hollow bearing trees; and
- one termite mound.

In total, the proposed development will result in the clearance of 7.24 ha of BC Act native vegetation. The proposed development will not result in any other direct impacts on native vegetation or habitat.

As shown in Figure 6 and Figure 16, the proposed development will also result in the clearance of:

- 4.31 ha of PCT1093 Zone 3 – Highly modified exotic vegetation; and
- 27.85 ha of PCT1334 Zone 3 – Highly modified exotic vegetation.

PCT1093 Zone 3 and PCT1334 Zone 3 are clearly dominated by exotic grasses and forbs, do not meet the definition of BC Act native vegetation, and are not identified as habitat for threatened species. Therefore, as per Chapter 10.4 of the BAM, these zones do not require further assessment with respect to ecosystem credits or species credits.

3.2.2 Indirect impacts on native vegetation and habitat

The proposed development has the potential to indirectly impact native vegetation and habitat adjacent to the subject land (i.e. the residual land within the study area and the vegetation/habitat immediately adjacent to the study area). Potential indirect impacts are listed below.

- Increased sedimentation of receiving waterways (i.e. Valley Creek or unnamed creek and then the Queanbeyan River) during construction.
- Increased noise, light, 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.
- Edge effects due to 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. By impacting native vegetation and habitat, indirect impacts also have the potential to impact the following threatened species and ecological communities.

- The threatened species listed in Table 15.
- White Box – Yellow Box – Blakely's Red Gum Woodland (BC Act Box-Gum Woodland).

However, the proposed development reduces the likelihood of indirect impacts by enacting the following principles detailed in Section 3.1.1 to avoid and minimise impacts to native vegetation and habitat.

- Locating the project in areas that are of negligible biodiversity value.
- Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score).
- Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained.
- Reducing the clearing footprint of the project.
- 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.
- Providing structures to enable species and genetic material to move across barriers or hostile gaps.
- Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation and habitat.

In addition, potential indirect impacts will be minimised and mitigated during construction by the measures outlined in Section 3.3.1 and during occupation by the measures outlined in Section 3.1.1 and Section 3.3.1. These measures:

- control potential sedimentation of receiving waterways during construction (Section 3.3.1);
- control noise, light, vibration, and dust spill during construction (Section 3.3.1);
- control weed introduction and/or spread during construction and occupation (Section 3.1.1 and Section 3.3.1);
- control incidental damage and removal of retained native vegetation and habitat during construction and occupation (Section 3.1.1 and Section 3.3.1);
- control pest animal populations as a result of increased human activity during occupation (Section 3.3.1); and
- reduce the impact of edge effects due to increased human activity during occupation (Section 3.3.1).

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 detailed in Section 3.1.2, the proposed development is unlikely to result in any prescribed biodiversity impacts.

3.3 Mitigation of Residual Impacts on Biodiversity Values

3.3.1 Mitigating residual impacts on native vegetation and habitat

The following mitigation techniques will be implemented to address the residual impacts on native vegetation and habitat before, 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.

- 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;
    - protective fencing around sensitive values;
    - buffer zones around sensitive values;
    - clearing procedures;
    - weed management procedures;
    - sediment and erosion controls to prevent site run-off;
    - noise, light, vibration, and dust control;
    - flow controls;
    - pollution and waste management;
    - water treatment standards before release; and
    - monitoring, reporting, and compliance requirements.
- Access tracks for construction will be restricted to within the boundary of the proposed development impact area (i.e. the subject land).
- Ancillary facilities for construction will be restricted to within the boundary of the proposed development impact area (i.e. the subject land).

- All trees to be retained will be protected and managed in accordance with the Tree Management Plan (Peet Pty Ltd 2019c)[39], Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.

- Trees to be cleared will be removed in accordance with the CEMP. At a minimum this will include pre-clearance surveys, clearing outside of the breeding season of most locally-occurring native fauna (i.e. August to December), and fauna rescue procedures.

- As per the Landscape Management Plan, eight of the cleared trees will be recovered for the purpose of fauna habitat enhancement.

- Weeds will be managed before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.

- Pest animals will be managed before and after construction according to the Vegetation Management Plan.

- Native vegetation to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.

- Fauna habitat features (such as hollow bearing trees, termite mounds, woody debris, surface rock, etc.) to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.

- Fences surround large lots will be simple star picket and three plain wire (i.e. non-barbed wire) design.

- Fences surrounding large lots will be located to avoid all impacts to termite mounds and hollow bearing trees.

- As per the Landscaping Management Plan and Vegetation Management Plan, landscaping for the proposed development in areas of the subject land outside of the newly created lots will use a mix of local native plant species and exotic 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.

- As per the Landscaping Management Plan and Vegetation Management Plan, landscaping for the proposed development in areas to be retained in residual land and large lots will only use PCT appropriate local native plant species. Where practicable, all strata will be re-established (i.e. groundcover, midstorey shrubs, and canopy trees) to create fauna habitat complexity.

[39] Peet Pty Ltd (2019c). *Jumping Creek Estate Development, Lot 5 DP1199045. Tree Management Plan*. Rev A, 9 April 2019.

3.3.2 Mitigating residual prescribed biodiversity impacts

As detailed in Section 3.1.2, the proposed development is unlikely to result in any prescribed biodiversity impacts and therefore dedicated mitigation measures are not required.

Notwithstanding this, the avoidance and minimisation measures detailed in Section 3.1.1 and the mitigation measures detailed in Section 3.3.1 will reduce the impact of the proposed development on the potential 'prescribed biodiversity impacts' identified in Section 3.1.2.

3.3.3 Adaptive management for uncertain impacts

As per Chapter 9.4 of 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. As per Chapter 9.4.2 of the BAM, the following impacts are identified as uncertain impacts.

- Impacts related to damage to karst, caves, crevices, cliffs and other geological features of significance.
- Impacts related to subsidence and upsidence resulting from underground mining.
- Impacts related to wind turbine strikes.
- Impacts related to vehicle strikes

The proposed development is unlikely to result in biodiversity impacts that are unforeseen or uncertain 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
- 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.

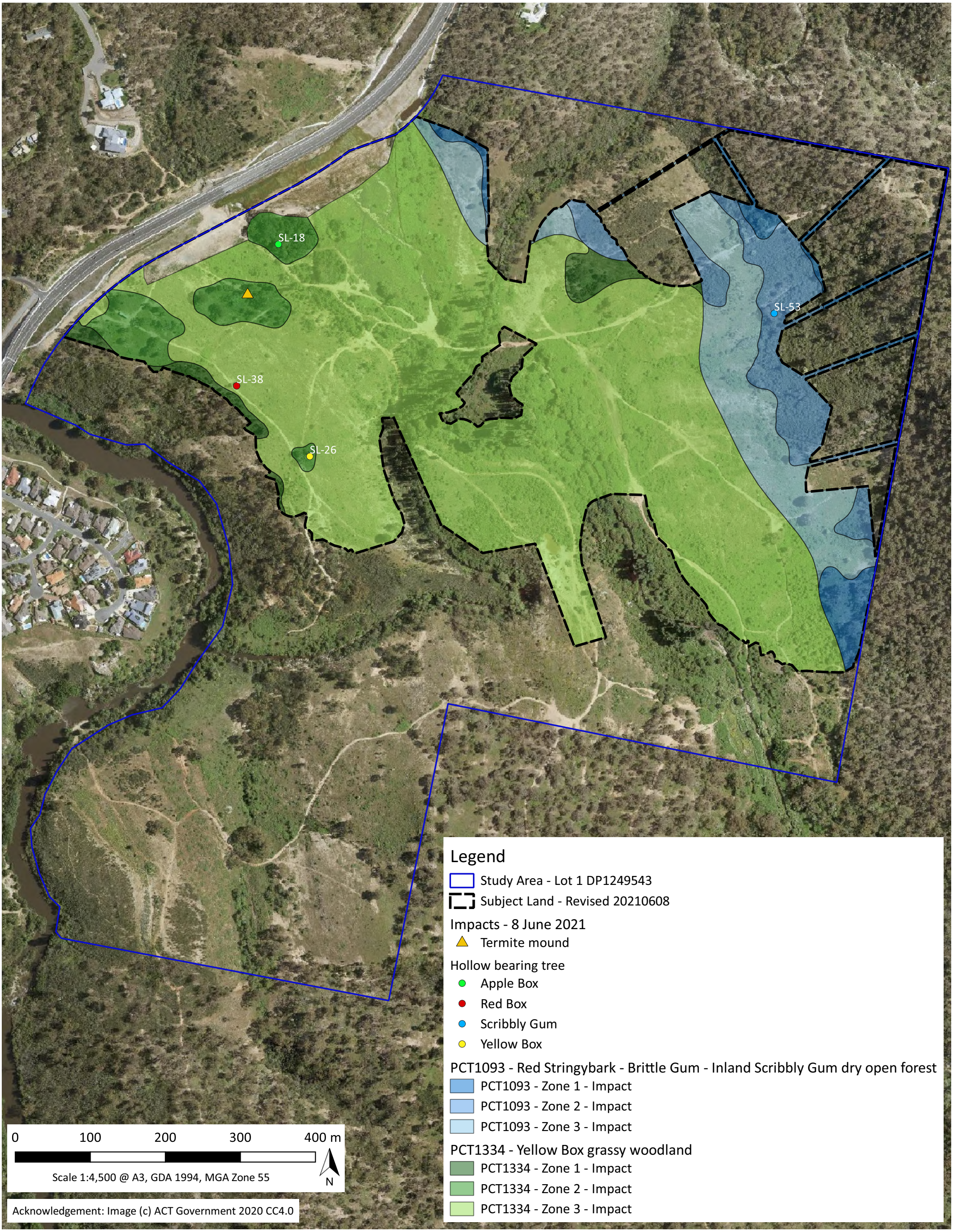

Figure 16. Residual Biodiversity Impacts of the Proposed Development

Capital Ecology Project No: 3026
Drawn by: S. Reid
Date: 29 June 2021

3.4 Serious and irreversible impacts

The guidance to assist a decisionmaker to determine a serious and irreversible impact (NSW Government 2017b[40]) 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 subject land does not contain habitat of potential significance to any threatened flora or fauna species listed as a SAII entity. However, the subject land does support the following ecological community which is listed as a SAII entity.

- PCT1334 – Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion (BC Act Box-Gum Woodland).

The proposed development will result in the removal of a total of 2.83 ha of BC Act listed Box-Gum Woodland (i.e. 0.85 ha of PCT1334 Zone 1 and 1.98 ha of PCT1334 Zone 2). The Department of Planning, Industry and Environment have advised that a decision has been made not to develop entity specific thresholds for SAII. Instead, decisions will be made on a case-by-case basis. Accordingly, the below additional information is provided to support the decision maker to determine if the proposed removal of 2.83 ha of BC Act Box-Gum Woodland constitutes a SAII.

a. the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

The proposed development enacts the following principles detailed in Section 3.1.1 to avoid and minimise impacts to native vegetation, including areas of BC Act Box-Gum Woodland.

- Locating the project in areas of negligible biodiversity value.
- Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score).
- Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained.
- Reducing the clearing footprint of the project.
- 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.
- Providing structures to enable species and genetic material to move across barriers or hostile gaps.
- Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation and habitat.

Potential indirect impacts, including indirect impacts to BC Act Box-Gum Woodland, will be minimised and mitigated during construction by the measures outlined in Section 3.3.1 and

[40] NSW Government (2017b). *Guidance to assist a decision-maker to determine a serious and irreversible impact*. State of New South Wales and Office of Environment and Heritage

during occupation by the measures outlined in Section 3.1.1 and Section 3.3.1. These measures include the following.

- A CEMP to guide the proposed development from before construction commences and until construction is completed.
- Weeds will be managed before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- Pest animals will be managed before and after construction according to the Vegetation Management Plan.
- Native vegetation to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- Fauna habitat features (such as hollow bearing trees, termite mounds, woody debris, surface rock, etc.) to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- As per the Landscaping Management Plan and Vegetation Management Plan, landscaping for the proposed development in areas to be retained in residual land and large lots will only use PCT appropriate local native plant species. Where practicable, all strata will be re-established (i.e. groundcover, midstorey shrubs, and canopy trees) to create fauna habitat complexity.

b. the area (ha) and condition of the TEC to be impacted directly and indirectly by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone

The proposed development will directly impact (i.e. remove) of a total of 2.83 ha of BC Act listed Box-Gum Woodland, comprised of the following two vegetation conditions zones.

- 0.85 ha of PCT1334 Zone 1. Vegetation Integrity Score of 48.7. As described in Table 9, this zone is characterised as '*Remnant woodland with all strata intact. Vegetation is in good condition, characterised by a native dominant groundstorey with a moderate to high diversity of native shrubs and forbs*.'
- 1.98 ha of PCT1334 Zone 2. Vegetation Integrity Score of 31.2. As described in Table ***10***, this zone is characterised as '*Woodland characterised by a native overstorey with a partially cleared midstorey and shrubstorey. The low diversity groundstorey is dominated by exotic grasses and forbs. Human activities have had an impact on this zone and there is evidence of historic clearing, grazing damage, and the presence of a moderate cover of significant weeds*.'

c. a description of the extent to which the impact exceeds the threshold for the potential entity

As described above, the Department of Planning, Industry and Environment have advised that a decision has been made not to develop entity specific thresholds for SAII. Instead, decisions will be made on a case-by-case basis.

d. the extent and overall condition of the potential TEC within an area of 1000ha, and then 10,000ha, surrounding the proposed development footprint

The Biodiversity Conservation Division (BCD) recommended (email of 12 September 2019 from Luke Perkins, Team Planning Leader, QPRC) that data provided for the Ellerton Drive Extension Species Impact Statement (NGH Environmental 2014[41]) may assist in developing the following sections of the SAII assessment. The study area for the Ellerton Drive Extension Species Impact Statement directly bordered the north of the study area for this BDAR.

With respect to the condition and extent of Box-Gum Woodland, the following pertinent data is presented in NGH Environmental (2014).

- Former (pre-1750) extent = 223,300 ha.
- Current extent = 12,200 ha (95% cleared).
- Total area formally reserved = 310 ha (< 0.01% of former extent). Box-Gum Woodland is therefore under-represented in the conservation reserve system.
- There is 3,121 ha of Box-Gum Woodland in the 'locality', at least half of which (1,546 ha) is in a moderate to good condition. The 'locality' in NGH Environmental (2014) was defined by a 10 km buffer to the study area. This area is directly comparable to the 10 km buffer presented in Figure 9 of this BDAR, which encompasses 33,803 ha. As such:
    - 9.23% (i.e. 3,121 ha) of the area within the 10 km buffer presented in Figure 9 supports Box-Gum Woodland (likely to meet the definition of BC Act Box-Gum Woodland).
    - 4.57% (i.e. 1,546 ha) of the area within the 10 km buffer presented in Figure 9 supports moderate to good condition Box-Gum Woodland (likely to meet the definition of EPBC Act and BC Act Box-Gum Woodland).
- Fallding (2002) estimates that there is more than 106,000 ha of Box-Gum Woodland within the NSW Southern Tablelands and ACT region. This does not include areas of secondary grassland that may also comprise the community.
- Keith (2006) estimates that there is 140,000 to 230,000 ha of Box-Gum Woodland within the South Eastern Highlands Bioregion.

Using the above information, the following estimations of the extent and overall condition of the potential TEC can be determined.

- Extent and overall condition within 1,000 ha. It is estimated that there is approximately 92.3 ha of BC Act Box-Gum Woodland, 45.7 ha of which is in moderate to good

[41] NGH Environmental (2014). *Species Impact Statement Ellerton Drive Extension*. June 2014, Final v1.2.

condition. The proposed impact of 2.83 ha therefore represents 3.07% of the Box-Gum Woodland within the 1,000 ha surrounding the subject land.

- Extent and overall condition within 10,000 ha. It is estimated that there is approximately 923 ha of BC Act Box-Gum Woodland, 457 ha of which is in moderate to good condition. The proposed impact of 2.83 ha therefore represents 0.31% of the Box-Gum Woodland within the 10,000 ha surrounding the subject land.

e. an estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration

As detailed in (d) above, the South Eastern Highlands is estimated to support between 106,000 ha and 230,000 ha of Box-Gum Woodland. The South Eastern Highlands is 8,376,018 ha in size. As such, approximately 1.27% (i.e. 106,000 ha) to 2.75% (i.e. 230,000 ha) of the South Eastern Highlands supports Box-Gum Woodland.

The subject land is within the Monaro IBRA subregion. The Monaro IBRA subregion is 1,267,650 ha in size. Assuming that Box-Gum Woodland is spread evenly across the South Eastern Highlands, the Monaro IBRA subregion therefore supports:

- between 16,099.16 ha and 34,860.38 ha of Box-Gum Woodland before the impact of the proposed development has been taken into consideration; and
- between 16,096.33 ha and 34,857.55 ha of Box-Gum Woodland after the impact of the proposed development has been taken into consideration.

This proposed development therefore removes an estimated 0.008% to 0.018% of the Box-Gum Woodland in the Monaro IBRA subregion.

f. an estimate of the area of the potential TEC that is in the reserve system within the IBRA region and the IBRA subregion

As detailed in (d) above, an estimated total of 310 ha of Box-Gum Woodland is in areas formally reserved. However, this estimate does not include the ACT (which falls within the Murrumbateman IBRA subregion). As detailed in ACT Government (2019[42]), approximately 4,507 ha of Box-Gum Woodland (comprised of Blakely's Red Gum – Yellow Box (± White Box) tall grassy woodland and Yellow Box – Apple Box tall grassy woodland) is in the reserve system or otherwise conserved in the ACT.

g. the development, clearing or biodiversity certification proposal's impact on:

i. abiotic factors critical to the long-term survival of the potential TEC; for example, how much the impact will lead to a reduction of groundwater levels or the substantial alteration of surface water patterns

As stated in NGH Environmental (2014):

> *The proposal is unlikely to impact upon groundwater levels in the vicinity of the Box-Gum Woodland community. Two bores associated with residential dwellings immediately north of the Queanbeyan River just to the west of the study area show*

[42] ACT Government (2019). *ACT native woodland conservation strategy and action plans*. Environment, Planning and Sustainable Development.

standing water levels of approximately 22 – 32 meters (NRAtlas 2013). Given that the bores are elevated above the river, the standing water levels correspond generally with the level of the water in the Queanbeyan River. Given that the Box-Gum Woodland community occurs at a minimum of approximately 40 m above the level of the Queanbeyan River, it is unlikely that it is dependent on the local groundwater resource.

Alterations to local drainage patterns are likely as a result of the sealing and drainage structures that are part of the proposal. However, given that the landscape position the community predominately occurs in hill crests and adjacent slopes, it is considered unlikely that the community depends on any specific existing drainage patterns. Impacts to the community from alterations to local hydrology are therefore considered unlikely

They study area for NGH Environmental (2014) immediately borders the north of the study area for this BDAR. As such, the above conclusions reached by NGH Environmental (2014) with respect to Box-Gum Woodland are applicable to the current proposed development.

In addition, as detailed in Section 3.1.1 and Section 3.3.1, a series of measures and management plans will ensure that the impacts associated with the proposed development do not extend beyond the subject land.

ii. characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants

As mentioned previously, the proposed development enacts the following principles detailed in Section 3.1.1 to avoid and minimise impacts to native vegetation, including areas of BC Act Box-Gum Woodland.

- Locating the project in areas of negligible biodiversity value.
- Locating the project in areas where the native vegetation or threatened species habitat is in the poorest condition (i.e. areas that have a lower vegetation integrity score).
- Locating the project such that connectivity enabling movement of species and genetic material between areas of adjacent or nearby habitat is maintained.
- Reducing the clearing footprint of the project.
- 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.
- Providing structures to enable species and genetic material to move across barriers or hostile gaps.
- Making provision for the demarcation, ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation and habitat.

In other words, the proposed development is largely located in an area that supports very low-quality vegetation. As a result, the proposed development's impact on characteristic and functionally important species is likely to be limited.

In addition, other potential impacts (including inappropriate fire/flooding regimes, removal of understorey species, harvesting of plants), will be minimised and mitigated during construction by the measures outlined in Section 3.3.1 and during occupation by the measures outlined in Section 3.1.1 and Section 3.3.1. These measures include:

- A CEMP to guide the proposed development from before construction commences and until construction is completed.
- Native vegetation to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- Fauna habitat features (such as hollow bearing trees, termite mounds, woody debris, surface rock, etc.) to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- Access tracks for construction will be restricted to within the boundary of the proposed development impact area (i.e. the subject land).
- Ancillary facilities for construction will be restricted to within the boundary of the proposed development impact area (i.e. the subject land).
- Walking trails and fire trials will be established in accordance with a trail management plan. This will help limit unintended impacts from human occupation of the subject land.

In summary, the degraded nature of the vegetation and habitat in the subject land combined with the avoidance, minimisation, and mitigation measures outlined in the BDAR ensure that the proposed development is unlikely to adversely alter the species composition of the Box-Gum Woodland which surrounds the subject land or within any other patch, lead to changes in fire or flooding regimes, or lead to increases in the harvesting of plants.

iii. the quality and integrity of an occurrence of the potential TEC through threats and indirect impacts including, but not limited to, assisting invasive flora and fauna species to become established or causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants which may harm or inhibit growth of species in the potential TEC

Potential indirect impacts, including indirect impacts to BC Act Box-Gum Woodland, will be minimised and mitigated during construction by the measures outlined in Section

3.3.1 and during occupation by the measures outlined in Section 3.1.1 and Section 3.3.1. These measures include:

- A CEMP to guide the proposed development from before construction commences and until construction is completed.
- Weeds will be managed before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- Pest animals will be managed before and after construction according to the Vegetation Management Plan.
- Native vegetation to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- Fauna habitat features (such as hollow bearing trees, termite mounds, woody debris, surface rock, etc.) to be retained in residual land and large lots will be protected before construction according to the Vegetation Management Plan, during construction according to the CEMP, and after construction according to the Vegetation Management Plan, Landscape Management Plan, and Subdivision Engineering Drawings and Reports.
- As per the Landscaping Management Plan and Vegetation Management Plan, landscaping for the proposed development in areas to be retained in residual land and large lots will only use PCT appropriate local native plant species. Where practicable, all strata will be re-established (i.e. groundcover, midstorey shrubs, and canopy trees) to create fauna habitat complexity.

h. direct or indirect fragmentation and isolation of an important area of the potential TEC

As mentioned previously, the proposed development has largely been located in areas that have been degraded to the extent that they no longer support native vegetation. As such, the proposed development will only impact five patches of PCT1334 which meet the definition of BC Act Box-Gum Woodland. These patches occur in the subject land and are small and already isolated. The removal of these five patches of BC Act Box-Gum Woodland is therefore unlikely to further fragment or isolate an important area of the TEC.

Within the wider study area, while meeting the definition of the TEC, the areas of BC Act Box-Gum Woodland do not constitute an important component of the ecological community in the locality or wider region. In addition, as detailed in Section 3.1.1.2, the connectivity along riparian corridors and the residual portions of the study area will be enhanced through weed control, feral animal control, and supplementary plantings of PCT appropriate species.

Therefore, fragmentation and isolation of the remaining patches of BC Act Box-Gum Woodland in the study area will not only be maintained but is likely to be enhanced

i. the measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

As detailed in Section 3.1.1.2, the proposed development retains 53.89 ha of vegetation in the residual lots and the portions of the large lots that are not impacted by the project. These residual areas support a variety of biodiversity values, including:

- 12.28 ha of PCT1334 Zone 1 – Moderate to high diversity intact, remnant vegetation (BC Act native vegetation, EPBC Act and BC Act Box-Gum Woodland);
- 0.46 ha of PCT1334 Zone 2 – Native overstorey with a low diversity exotic groundlayer (BC Act native vegetation, BC Act Box-Gum Woodland); and
- 28.05 ha of PCT1334 Zone 3 – Highly modified exotic vegetation.

In total, the residual areas therefore support 12.74 ha of moderate to high quality BC Act Box-Gum Woodland. In order to protect these values, the residual land will be managed in accordance with the Vegetation Management Plan and Landscape Management Plan. In large lots, this will occur under the enforcement of a Section 88B instrument. As outlined in the Vegetation Management Plan and Landscape Management Plan, the residual land will be intensively remediated and managed by the proponents for 3 years. Following this period, the residual land (with the exception of the land in the six large lots) will be vested to Council for long-term management. The management of the residual land differs depending on the ecological values each area possesses and is described in detail in the Vegetation Management Plan and Landscape Management Plan. In brief, management of residual land includes the following.

- Protection of existing native vegetation. Removal or destruction of native vegetation in residual land will be prohibited, unless otherwise stipulated under other legislation or approvals.
- Protection of existing fauna habitat features. Removal or destruction of fauna habitat features (e.g. hollow bearing trees, termite mounds, woody debris, surface rock, etc.) will be prohibited, unless otherwise stipulated under other legislation or approvals.
- Weed control. Weed control will be achieved through a mix of direct removal, spot spraying, stem injection, and 'cut and dab' techniques. Initial knockdown will occur over the growing months, then ongoing follow-up control annually for the first 3 years to achieve an effective knock-down. Ongoing control will depend on results of a weed monitoring program to address any site-specific outbreaks as they occur but should be at the maintenance level if years 1-3 are undertaken effectively.
- Feral animal control. Feral animals will initially be controlled using a variety of techniques, potentially including poisonous baits, habitat destruction (i.e. ripping warrens), and direct elimination (i.e. shooting).
- Revegetation using PCT appropriate native species across multiple strata. Supplementary plantings in specific areas will occur with an aim to rehabilitate

degraded vegetation, increase functional connectivity across the study area, reduce erosion, and improve water quality.

- Establishment of walking trails and fire trials in accordance with a trail management plan. This will help limit unintended impacts from human occupation of the subject land.

These management actions include many of those recommended in the TBDC for Box-Gum Woodland and so address many of the identified key threats to this ecological community. As a result, the proposed development will protect 12.74 ha of BC Act Box-Gum Woodland and has the potential to increase the extent and connectivity of BC Act Box-Gum Woodland within the study area and adjoining land.

3.5 Legislative Requirements

3.5.1 Commonwealth EPBC Act – Referral

As mentioned previously, the proposed development was the subject of an EPBC Act referral (EPBC Act Ref:2019/8486) (the referral being informed by the previous version of this BDAR [Capital Ecology 2019]). The decision of the referral was that the proposed action (i.e. the proposed development) is **not a controlled action**. Therefore, this BDAR does not include any assessment of the potential impacts of the proposed development on MNES listed pursuant to the EPBC Act.

3.5.2 NSW BC Act – 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 G.

3.5.2.1 Biodiversity risk weighting

The biodiversity risk weighting (Section 6.6 of the BAM) 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.

The subject land contains vegetation with a vegetation integrity score that requires offsetting for impacts on ecosystem credits, including vegetation which meets the definition of a TEC (i.e. PCT1334). The biodiversity risk rating associated with each PCT differs and, as shown below, there is a greater risk weighting for the TEC.

- PCT1093 – Biodiversity risk rating of 1.75.
- PCT1334 – Biodiversity risk rating of 2.00.

3.5.2.2 Ecosystem credit requirements

The results of the BAM credit calculations completed for the proposed development are provided in Table 17. As shown in Table 17, three of the vegetation zones in the proposed impact area (i.e. the subject land) have a vegetation integrity score sufficient for their clearance to result in generation of ecosystem credits, as outlined in Section 10.3.1.1 of the BAM, these being:

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

Accordingly, the proposed development generates an ecosystem credit obligation.

Table 17. Ecosystem credit requirements.

PCT & Vegetation Zone	Vegetation Integrity Score	Proposed Clearance Area (ha)	Credits Required
PCT1093 Zone 1	47.6	1.48	31
PCT1093 Zone 2	9.5	2.93	0
PCT1334 Zone 1	48.7	0.85	26
PCT1334 Zone 2	31.2	1.98	39

3.5.2.3 Species credit requirements

As detailed herein, 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.

3.5.2.4 Estimated credit obligation

Table 18 outlines the estimated credit obligation associated with the proposed development as determined by the BAM Calculator on 29 June 2021.

It is important to note that the baseline price per credit is subject to change (up or down) as influenced by trades in the subject credits and other market factors. The below estimate is based on the credit prices for the relevant entities on 29 June 2021; the actual credit price and corresponding monetary value of the credit obligation will be determined at the time at which the required credits are retired.

Table 18. Ecosystem credits for plant community types (PCTs), ecological communities and threatened species habitat.

IBRA sub region	PCT	Risk premium	Administrative cost	Methodology adjustment factor	Charge per credit	No. of ecosystem credits	Final credits charge
Monaro	1093	20.69%	$159.41	3.0383	$4,969.29	31	$154,047.85
Monaro	1334	20.69%	$134.31	0.7822	$4,186.78	65	$272,140.56
						Subtotal (excl. GST)	$426,188.41
						GST	$42,618.84
						Total ecosystem credits (incl. GST)	$468,807.25

3.5.2.5 Credit obligation options

As detailed by the NSW Department of Planning, Industry and Environment[43], the proponent can address the estimated offset obligation outlined in Table 18 in the following two ways.

1. The proponent can '*identify and purchase the required 'like for like' credits in the market and then retire those credits via OEH BOAMS* [Biodiversity Offsets and Agreement Management System]. *For example, credits could be located by using the OEH registers or by retaining a broker to locate credits for them.'*

2. The proponent can '*use the Offsets Payment Calculator to determine the cost of its credit obligation, and transfer this amount to the Biodiversity Conservation Fund via OEH BOAMS. The Biodiversity Conservation Trust is then responsible for identifying and securing the credit obligation.'*

When the proponent has completed these steps for all credits that the proponent is required to retire, they can proceed with their activity in accordance with their approval. The consent authority is responsible for ensuring compliance with credit obligations, and any other conditions of the consent or approval.

If the proponent chooses Option 2 to meet the credit obligations, the amount which must be paid into the Biodiversity Conservation Fund is determined at the time the proponent applies for an invoice from the Biodiversity Conservation Trust. A risk premium is included in that calculation to account for fact that the risks and costs involved in securing the offset have effectively been transferred to the Biodiversity Conservation Trust. These risks include the statistical probability that the market credit price paid by the Biodiversity Conservation Trust to landholders is higher or lower than that predicted. The benefits associated with Option 2 include a more streamlined process and no ongoing obligations once the required amount has been paid to the Biodiversity Conservation Fund.

If the proponent chooses Option 1 to meet the credit obligations, the cost per credit purchased from the market is likely to be lower than that to pay into the Biodiversity Conservation Fund, and as such, the total monetary cost of the offset obligation is likely to be lower than Option 2. However, the disadvantages associated with Option 1 include a more complicated process and potential delays associated with sourcing credits from the BOS credit market.

[43] https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme

3.5.3 NSW Koala SEPP – Koala Habitat Protection Requirements

Regarding the application of the *State Environmental Planning Policy (Koala Habitat Protection) 2021* (the 'Koala Habitat Protection SEPP') for the proposed development of the subject land, the following points are noted.

5. The subject land is located within the Queanbeyan-Palerang Regional Local Government Area (LGA), which is an LGA to which he Koala Habitat Protection SEPP applies as listed in Schedule 1.

6. The subject land and wider study area have an area of greater than 1 hectare.

7. The subject land and wider study area support tree species listed in Schedule 2 of the Koala Habitat Protection SEPP. Accordingly, the subject land supports 'potential koala habitat'.

8. Over the past 18 years, BioNet records four Koala sightings within 2.5 km of the subject land (recorded in 2007, 2016, 2018, and 2019). These Koala records occur in well-timbred vegetation to the north and north-east of the subject land (Figure 9).

   However, approximately 89% of the subject land has been historically cleared. As a result, the remaining vegetation is largely isolated and fragmented and the midstorey and shrubstorey are largely absent. In addition, despite being conspicuous when present, no Koalas or signs of Koala presence were detected during the tree habitat assessment, fauna nesting survey, multiple other surveys (e.g. plot/transects, threatened flora and bird surveys, threatened nocturnal fauna surveys), or by previous targeted surveys (EcoLogical Australia 2010). The degraded vegetation and lack of Koala observations indicates that the subject land should not be classified as 'highly suitable habitat' or 'core Koala habitat'.

With regard to the above and with respect to the Koala Habitat Protection SEPP, the subject land and wider study area are therefore considered unlikely to constitute 'highly suitable habitat' or 'core Koala habitat'.

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- *LEP Land Zoning Map - Sheet LZN_005 and LZN_006*

- *LEP Lot Size Map - Sheet LSZ_005 and LSZ_006.*
- *LEP Terrestrial Biodiversity Map - Sheet BIO_001.*

Appendices

Appendix A. BAM plot/transect scores

PCT code	Veg. Zone	Plot No.	Composition (species richness)					
			Tree	Shrub	Grass & grass like	Forb	Fern	Other
1093	1	1	3	5	2	7	0	0
		2	2	6	1	3	0	0
		3	2	4	2	7	0	1
	2	1	0	3	2	5	0	1
		2	0	4	0	1	0	0
		3	0	2	1	1	0	1
	3	1	0	0	1	2	0	0
		2	1	1	2	4	1	0
1334	1	1	2	3	2	3	0	2
		2	1	4	1	10	0	1
		3	3	2	5	7	1	4
		4	2	5	8	8	1	2
		5	1	2	2	8	1	1
	2	1	1	0	3	4	0	2
		2	2	3	1	1	0	0
	3	1	0	0	1	4	0	0
		2	0	0	4	1	0	0
		3	0	0	0	5	0	0
		4	0	1	0	1	0	0
		5	1	2	0	1	0	0

PCT code	Veg. Zone	Plot No.	Composition (species richness)					
			Tree	Shrub	Grass & grass like	Forb	Fern	Other
		6	0	0	0	0	0	0
		7	0	2	1	0	0	0
		8	0	1	1	1	0	0

PCT code	Veg. Zone	Plot No.	Structure (% cover)					
			Tree	Shrub	Grass & grass like	Forb	Fern	Other
1093	1	1	20	20.4	0.2	0.7	0	0
		2	35	3.6	0.1	0.3	0	0
		3	25	5.4	1.2	0.8	0	0.5
	2	1	0	31.5	8	0.6	0	0.1
		2	0	85.3	0	0.1	0	0
		3	0	70.1	1	0.1	0	0.1
	3	1	0	0	0.2	0.2	0	0
		2	1.5	1.5	4.5	3	0.1	0
1334	1	1	45	5.2	1.1	0.3	0	1.1
		2	15	10.2	1	1.9	0	0.1
		3	31	48	2.4	0.8	0.1	0.4
		4	33	25.2	2.7	1	0.1	0.2
		5	25	72	0.3	0.8	0.1	0.2
	2	1	15	0	0.3	0.35	0	2.6
		2	55	10.1	0.1	0.1	0	0
	3	1	0	0	2	0.8	0	0
		2	0	0	0.6	0.1	0	0
		3	0	0	0	0.6	0	0
		4	0	0.1	0	0.1	0	0
		5	5	25	0	0.1	0	0
		6	0	0	0	0	0	0
		7	0	10.1	0.1	0	0	0
		8	0	2	0.1	3	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					
1093	1	1	Y	Y	Y	Y	Y	0	1	30	11	0
		2	-	Y	Y	Y	Y	1	1	71.8	8	0
		3	Y	Y	Y	-	Y	2	4	38.4	9	5.1
	2	1	-	-	-	-	-	0	0	6	0	0.2
		2	-	-	-	-	-	0	0	24	0	0
		3	-	-	-	-	-	0	0	45	0	6
	3	1	-	-	-	-	-	0	0	3.6	0	20.1
		2	-	-	Y	-	-	0	0	7.1	0	20.3
1334	1	1	Y	Y	Y	Y	Y	1	1	63.4	25	2.6
		2	Y	Y	Y	Y	-	2	1	52	16	0.9
		3	Y	Y	Y	Y	Y	1	0	74	45	3.4
		4	Y	Y	Y	Y	Y	1	1	67	40	5.2
		5	Y	-	Y	Y	Y	0	0	91.6	0	0.2
	2	1	Y	Y	Y	Y	Y	1	1	69.6	9	19.6
		2	Y	Y	Y	Y	Y	1	1	95	50	10.4
	3	1	-	-	-	-	-	0	0	25.8	0	55.7
		2	-	-	-	-	-	0	0	23.8	0	21.5
		3	-	-	-	-	-	0	0	65	0	30.2
		4	-	-	-	-	-	0	0	28	0	3.4
		5	Y	Y	Y	-	-	0	0	46.2	10	66
		6	-	-	-	-	-	0	0	62	20	53.1
		7	-	-	-	-	-	0	0	75	20	85
		8	-	-	-	-	-	0	0	69.6	8	30.3

Appendix B. Flora species recorded by plot and percent cover or presence

Scientific name	Common name	Plot ID																							
		1334.1.1	1334.1.2	1334.1.3	1334.1.4	1334.1.5	1334.2.1	1334.2.2	1334.3.1	1334.3.2	1334.3.3	1334.3.4	1334.3.5	1334.3.6	1334.3.7	1334.3.8	1093.1.1	1093.1.2	1093.1.3	1093.2.1	1093.2.2	1093.2.3	1093.3.1	1093.3.2	Threatened flora surveys
Exotic																									
Acetosella vulgaris	Sheep's Sorrel								0.1														5.0	0.1	
Ailanthus altissima	Tree of Heaven										25.0			0.1	10.0				3.0			2.0			X
Anagallis arvensis	Scarlet Pimpernel																								X
Celtis australis	European Hackberry																								X
Centaurium sp.	Common Centaury		0.1	0.1	0.1	0.1	0.1		0.1		0.1		0.1	0.1	0.1					0.1	0.1	0.1		0.1	X
Cerastium sp.	Mouse-ears																				0.0				
Cicendia quadrangularis	Yellow Centaury																								X
Cirsium vulgare	Spear Thistle										0.1														X
Conium maculatum	Hemlock															40.0									X
Cotoneaster sp.	Cottoneaster																								X
Crataegus monogyna	Common Hawthorn		0.2										15.0	15.0	25.0	15.0							0.1		X
Cynosurus echinatus	Dogstail Grass											0.1			1.0										
Cyperus eragrostis	Tall Flat-sedge	0.1		0.1		0.1	1.5			1.0	0.1					0.1									
Echium plantagineum	Paterson's Curse					0.1	0.6		0.5	1.0	1.0	1.0			0.2										X
Echium vulgare	Viper's-bugloss																							2.5	
Galium aparine	Goosegrass																								X
Hirschfeldia incana	Buchan Weed															0.1									
Hypericum perforatum	St John's Wort	2.0	0.2	3.0	5.0	0.1	8.5	0.1	5.0	2.0		1.0	5.0	5.0	1.0				2.0			2.0	10.0	15.0	X
Hypochaeris glabra	Smooth Cats-ear																			0.0					
Hypochaeris radicata	Flatweed																			0.1	0.1				
Ligustrum sp.	Privet																								X
Lycium ferocissimum	African Boxthorn																								X
Marrubium vulgare	White Horehound		0.1				0.1		2.0		0.1	20.0				1.0							2.0		X
Modiola caroliniana	Red-flowered Mallow								0.1																
Myosotis discolor	Forget-me-not								0.1																X
Nassella trichotoma	Serrated Tussock		0.1	0.1			7.6	0.1	0.5	15.0		2.0	2.0	5.0	1.0					0.2		2.0	5.0	2.5	X
Onopordum acanthium	Scotch Thistle															0.1									
Opuntia stricta	Common Prickly Pear																								X
Paronychia brasiliana	Brazilian Whitlow																								X
Petrorhagia nanteuilii	Proliferous Pink	0.1																							
Pinus radiata	Radiata Pine																								X
Plantago lanceolata	Plantain / Lamb's Tongue	0.1	0.1		0.1		0.1		0.1															0.1	X
Populus alba	White Poplar																								X
Populus nigra	Black Poplar													2.0	20.0										X
Prunus sp.	Plum								0.1																X
Pteridium esculentum	Bracken Fern																								X
Pyracantha angustifolia	Orange Firethorn		0.1		0.1									5.0											X
Romulea rosea	Onion Grass							0.2																	
Rosa rubiginosa	Briar Rose	0.5	0.2	0.1	0.1		2.0		0.1	0.5	0.1	0.3	4.0	1.0	3.0	0.2			0.1					0.2	X
Rubus fruticosus	Blackberry		0.1	0.1			0.1	10.0	50.0	3.0	5.0	0.1	40.0	20.0	25.0	15.0								2.5	X
Salix sp.	Willow																								X
Sanguisorba minor	Sheep's Burnet																								X
Solanum linnaeanum	Apple of Sodom																								X
Trifolium sp.	Clover																		0.1					0.5	
Ulmus sp.	Elm					0.1								20.0											X
Urtica dioica	Stinging Nettle					0.1										0.1									X
Verbascum thapsus	Common Mullein				0.1				0.5	0.1	3.0	0.1	0.1							0.1					X
Vicia sativa	Common Vetch																								X
Native																									
Acacia baileyana	Cootamundra Wattle																								X
Acacia genistifolia	Early Wattle																								X
Acacia mearnsii	Black Wattle		5.0	3.0	5.0	2.0		5.0				0.1						0.2	5.0						X
Acacia rubida	Red-leaved Wattle																			1.0					X

Scientific name	Common name	Plot ID																							
		1334.1.1	1334.1.2	1334.1.3	1334.1.4	1334.1.5	1334.2.1	1334.2.2	1334.3.1	1334.3.2	1334.3.3	1334.3.4	1334.3.5	1334.3.6	1334.3.7	1334.3.8	1093.1.1	1093.1.2	1093.1.3	1093.2.1	1093.2.2	1093.2.3	1093.3.1	1093.3.2	Threatened flora surveys
Acaena ovina	Sheep's Burr		0.1	0.1	0.2	0.1	0.0		0.1		0.1		0.1												X
Acrotriche serrulata	Honeypots																								X
Ajuga australis	Austral bugle		0.1			0.1																			X
Alternanthera nana	Hairy Joyweed																					0.1			
Amyema sp.	Mistletoe	1.0		0.1			2.5																		X
Asperula conferta	Common Woodruff																								X
Asplenium flabellifolium	Necklace Fern					0.1																			X
Astroloma humifusum	Native Cranberry																				0.1	0.1			X
Austrostipa bigeniculata	Tall Speargrass			0.1		0.1				0.1															X
Austrostipa scabra	Rough Speargrass	1.0	1.0	2.0	0.1		0.1			0.3							0.1		1.0	3.0		1.0			X
Bossiaea buxifolia	Matted Bossiaea																				0.1				
Bothriochloa macra	Red-leg Grass																			5.0				1.0	X
Brachyloma daphnoides	Daphne Heath																								X
Bracteantha viscosa	Sticky Everlasting		0.1		0.1												0.1		0.1	0.1					X
Bulbine glauca	Rock Lily																								X
Bursaria lasiophylla	Native Blackthorn		0.1	45.0	10.0																				X
Carex inversa	Knob Sedge																								X
Cassinia longifolia	Long-leaf Cassinia							0.1																	X
Cassinia quinquefaria	Wild Rosemary				0.1														0.1						X
Cheilanthes sieberi	Rock Fern			0.1	0.1																			0.1	X
Chrysocephalum apiculatum	Common Everlasting																			0.1					X
Chrysocephalum semipapposum	Yellow Buttons		1.0	0.2																					X
Clematis microphylla	Small-leaved Clematis			0.1	0.1	0.2													0.5						X
Convolvulus erubescens	Australian Bindweed	0.1		0.1			0.1																		X
Cymbonotus lawsonianus	Bear's Ears					0.1																			
Cymbopogon refractus	Barbed Wire Grass																								X
Daucus glochidiatus	Native Carrot																								X
Daviesia genistifolia	Broom Bitter Pea																								X
Desmodium varians	Slender Tick-trefoil		0.1	0.1	0.1		0.0													0.1					X
Dianella revoluta	Blue Flax-Lily																	0.1							X
Dichondra repens	Kidney Weed					0.1													0.2						X
Dillwynia sericea	Showy Parrot-Pea																	0.1							X
Einadia nutans	Climbing Saltbush	0.1		0.1				0.1									0.1	0.1	0.1						X
Elymus scaber	Common Wheat Grass			0.1		0.2		0.1																	X
Eucalyptus blakelyi	Blakely's Red Gum			1.0																					
Eucalyptus bridgesiana	Apple Box				30.0	25.0		40.0																	X
Eucalyptus macrorhyncha	Red Stringybark	10.0															5.0		20.0						X
Eucalyptus melliodora	Yellow Box	35.0	15.0	20.0			15.0	15.0																	X
Eucalyptus nortonii	Bundy																10.0								X
Eucalyptus polyanthemos	Red Box			10.0	3.0													15.0						1.5	X
Eucalyptus rossii	Scribbly Gum																5.0	20.0	5.0						X
Eucalyptus sp.	Eucalyptus cultivar												5.0												
Euphorbia drummondii	Caustic Spurge				0.1																				
Exocarpos cupressiformis	Native Cherry																								X
Galium gaudichaudii	Rough Bedstraw																								X
Geranium solanderi	Native Geranium		0.1		0.1		0.1																		X
Glycine clandestina	Twining Glycine																					0.1			
Glycine tabacina	Variable Glycine																								X
Gonocarpus tetragynus	Common Raspwort		0.1	0.1																					
Goodenia hederacea	Ivy Goodenia		0.1	0.1			0.0										0.1								X
Goodenia pinnatifida	Cut-Leaved Goodenia																								X
Hardenbergia violacea	False Sarsaparilla																								X
Hibbertia obtusifolia	Hoary Guinea Flower	0.1	0.1														0.1	0.1		0.5	0.1				X
Hibbertia riparia	Grey Guinea Flower																								X
Hydrocotyle laxiflora	Stinking Pennywort					0.1					0.1						0.1		0.1						X
Hydrocotyle peduncularis	Small-leaved Pennywort	0.1																							

Scientific name	Common name	Plot ID																							
		1334.1.1	1334.1.2	1334.1.3	1334.1.4	1334.1.5	1334.2.1	1334.2.2	1334.3.1	1334.3.2	1334.3.3	1334.3.4	1334.3.5	1334.3.6	1334.3.7	1334.3.8	1093.1.1	1093.1.2	1093.1.3	1093.2.1	1093.2.2	1093.2.3	1093.3.1	1093.3.2	Threatened flora surveys
Hypericum gramineum	Native St John's Wort																0.1				0.1				X
Indigofera australis	Australian Indigo																0.1		0.1						X
Joycea pallida	Red-Anther Wallaby Grass																0.1	0.1							X
Juncus filicaulis	Pinrush				0.1																				
Kunzea ericoides	Burgan	5.0	5.0		10.0	70.0		5.0					10.0		10.0	2.0	20.0	3.0	0.2	30.0	85.0	70.0		1.5	X
Lepidosperma laterale	Variable Swordsedge																								X
Leptorhynchos squamatus	Scaly Buttons		0.1																						
Leptospermum multicaule	Silver Tea-tree														0.1										X
Leucopogon microphyllus	Hairy Beard-Heath																								X
Lomandra coriacea	Wattle Mat-rush				0.1														0.2						X
Lomandra filiformis	Wattle Mat-rush				0.1																				X
Lomandra longifolia	Spiny-head Mat-rush																								X
Melaleuca sp.	River Bottlebrush												15.0												X
Melichrus urceolatus	Urn Heath																								X
Microlaena stipoides	Weeping Grass			0.1	0.1		0.1																0.2		
Oxalis perennans	Woody-Root Oxalis				0.1	0.1	0.1		0.5	0.1	0.2									0.1			0.1	0.2	X
Panicum effusum	Hairy Panic				0.1		0.1			0.1						0.1									
Persicaria decipiens	Slender Knotweed															3.0									
Persicaria prostrata	Creeping Knotweed								0.1																X
Pimelea curviflora	Curved Rice-flower																								X
Poa labillardieri	River Tussock-grass														0.1										
Poa sieberiana	Snowgrass			0.1																					X
Pomaderris betulina	Birch Pomaderris																								X
Pomaderris eriocephala	Wooly-headed Pomaderris																								X
Pomaderris ericifolia	Pomaderris				0.1												0.1	0.1							
Rumex brownii	Swamp Dock	0.1				0.1	0.1		0.1		0.1	0.1							0.1				0.1	0.1	X
Rytidosperma sp.	Wallaby Grass	0.1			2.0				2.0	0.1														3.5	X
Scleranthus biflorus	Knawel																								X
Senecio quadridentatus	Cotton Fireweed			0.1		0.1																			
Solanum cinereum	Narrawa Burr	0.1																							
Solenogyne dominii	Smooth Solengyne				0.1																				X
Stackhousia monogyna	Creamy Candles																								X
Stellaria pungens	Prickly Starwort																0.1		0.1						
Stypandra glauca	Nodding Blue Lily																	0.1							
Styphelia triflora	Pink Five-Corners																0.1	0.1							X
Themeda triandra	Kangaroo Grass				0.1																				X
Triptilodiscus pygmaeus	Common Sunray																								X
Vittadinia muelleri	Narrow-leaved New Holland Daisy		0.1	0.1	0.2						0.1								0.1	0.2				2.6	X
Wahlenbergia communis	Native Bluebell		0.1		0.1		0.1										0.1			0.1				0.1	X
Wahlenbergia gracilis	Common Bluebell																								X

Appendix C. Tree habitat assessment results

Tree number	Tree ID	Species Name	Common Name	Remnant/ Planted	DBH (cm)	Height (m)	Hollows			Alive/ Dead	Notes
							S	M	L		
1	SL-26	*E. melliodora*	Yellow Box	R	91	16		1		A	Mistletoe x 6. Boxthorn at base of tree with a Yellow-rumped Thornbill nest
2	SL-38	*E. polyanthemos*	Red Box	R	48	8	1			A	
3	SL-18	*E. bridgesiana*	Apple Box	R	240	15			1	A	Large hollow (shallow) with small nest @ 4 m
4	CE-4	*E. rossii*	Scribbly Gum	R	125	14	6			A	
5	CE-5	*E. rossii*	Scribbly Gum	R	105	14	1		2	A	
6	CE-6	*E. rossii*	Scribbly Gum	R	92	8	2			A	Hollows in forks of branches. Multi-stemmed
7	CE-7	*E. macrorhyncha*	Red Stringybark	R	74	5	1		2	A	
8	CE-8	*E. macrorhyncha*	Red Stringybark	R	69	8	1			A	
9	CE-9	*E. macrorhyncha*	Red Stringybark	R	53	8	1		1	D	
10	CE-10	*E. polyanthemos*	Red Box	R	40	10		3		A	
11	CE-11	*E. macrorhyncha*	Red Stringybark	R	60	15	1			D	
12	CE-12	-	-	-	-	-	-	-	-	-	Tree is not in study area
13	CE-13	*E. polyanthemos*	Red Box	R	60	15		1		A	
14	SL-42	*E. rossii*	Scribbly Gum	R	64	14	3	1	1	A	
15	CE-15	*E. nortonii*	Bundy	R	45	11		1		A	
16	CE-16	*E. macrorhyncha*	Red Stringybark	R	91	10		1		A	Trunk shows evidence of fire damage
17	CE-17	*E. polyanthemos*	Red Box	R	33	5			1	A	Large hollow goes through entire trunk
18	SL-53	*E. rossii*	Scribbly Gum	R	95	11	1	2		A	Epicormic sprouting
19	CE-19	*E. bridgesiana*	Apple Box	R	220	12		2	2	A	Honeybees in fissure of trunk
20	CE-20	*E. bridgesiana*	Apple Box	R	122	10		2	2	A	Recently dropped a large limb

Hollow size: **S** = small (< 5 cm); **M** = medium (5-20 cm); **L** = large (> 20 cm)

Appendix D. Fauna Species Recorded

Class	Common name	Scientific name	BC Act status	Survey
Amphibia	Common Eastern Froglet	*Crinia signifera*	Protected	Pink-tailed Legless Lizard survey; Nocturnal survey
Amphibia	Spotted Marsh Frog	*Limnodynastes tasmaniensis*	Protected	Pink-tailed Legless Lizard survey; Nocturnal survey
Amphibia	Southern Banjo Frog	*Limnodynastes dumerilii*	Protected	Pink-tailed Legless Lizard survey
Amphibia	Lesueur's Tree-frog	*Litoria lesueuri*	Protected	Nocturnal survey
Arachnida	Black Rock Scorpion	*Urodacus manicatus*	Protected	Pink-tailed Legless Lizard survey
Aves	Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Protected	Bird survey; Opportunistic
Aves	Brown Thornbill	*Acanthiza pusilla*	Protected	Opportunistic
Aves	Eastern Spinebill	*Acanthorhynchus tenuirostris*	Protected	Bird survey; Opportunistic
Aves	Red Wattlebird	*Anthochaera carunculata*	Protected	Bird survey
Aves	Wedge-tail Eagle	*Aquila audax*	Protected	Bird survey; Opportunistic
Aves	**Dusky Woodswallow**	***Artamus cyanopterus***	**Vulnerable**	**Bird survey; Opportunistic**
Aves	Sulphur-crested Cockatoo	*Cacatua galerita*	Protected	Bird survey
Aves	European Goldfinch	*Carduelis carduelis*	-	Bird survey
Aves	Horsfield's Bronze-cuckoo	*Chalcites basalis*	Protected	Bird survey
Aves	Australian Wood Duck	*Chenonetta jubata*	Protected	Bird survey
Aves	Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Protected	Bird survey
Aves	Australian Raven	*Corvus coronoides*	Protected	Bird survey; Opportunistic
Aves	Laughing Kookaburra	*Dacelo novaeguineae*	Protected	Bird survey; Stag-watch survey; Opportunistic
Aves	White-faced Heron	*Egretta novaehollandiae*	Protected	Bird survey
Aves	Galah	*Eolophus roseicapilla*	Protected	Bird survey; Opportunistic
Aves	Eastern Yellow Robin	*Eopsaltria australis*	Protected	Bird survey
Aves	Dollarbird	*Eurystomus orientalis*	Protected	Bird survey
Aves	Brown Falcon	*Falco berigora*	Protected	Bird survey
Aves	Nankeen Kestrel	*Falco cenchroides*	Protected	Bird survey

Class	Common name	Scientific name	BC Act status	Survey
Aves	Australian Magpie	*Gymnorhina tibicen*	Protected	Bird survey; Opportunistic
Aves	Welcome Swallow	*Hirundo neoxena*	Protected	Opportunistic
Aves	White-winged Triller	*Lalage tricolor*	Protected	Bird survey
Aves	Yellow-faced Honeyeater	*Lichenostomus chrysops*	Protected	Bird survey
Aves	Superb Fairy-wren	*Malurus cyaneus*	Protected	Bird survey; Opportunistic
Aves	Noisy Miner	*Manorina melanocephala*	Protected	Bird survey
Aves	Superb Lyrebird	*Menura novaehollandiae*	Protected	Bird survey
Aves	Rainbow Bee-eater	*Merops ornatus*	Protected	Bird survey
Aves	Leaden Flycatcher	*Myiagra rubecula*	Protected	Bird survey
Aves	Red-browed Finch	*Neochmia temporalis*	Protected	Opportunistic
Aves	White-eared Honeyeater	*Nesoptilotis leucotis*	Protected	Bird survey
Aves	Rufus Whistler	*Pachycephala rufiventris*	Protected	Bird survey
Aves	Spotted Pardalote	*Pardalotus punctatus*	Protected	Bird survey; Opportunistic
Aves	Tree Martin	*Petrochelidon nigricans*	Protected	Bird survey
Aves	**Scarlet Robin**	***Petroica boodang***	**Vulnerable**	**Opportunistic**
Aves	Common Bronzewing	*Phaps chalcoptera*	Protected	Bird survey
Aves	Noisy Friarbird	*Philemon corniculatus*	Protected	Bird survey
Aves	Crimson Rosella	*Platycercus elegans*	Protected	Bird survey
Aves	Grey Fantail	*Rhipidura albiscapa*	Protected	Bird survey; Opportunistic
Aves	Willie Wagtail	*Rhipidura leucophrys*	Protected	Bird survey
Aves	White-browed Scrubwren	*Sericornis frontalis*	Protected	Bird survey
Aves	Weebill	*Smicrornis brevirostris*	Protected	Opportunistic
Aves	**Diamond Firetail**	***Stagonopleura guttata***	**Vulnerable**	**Bird survey**
Aves	Pied Currawong	*Strepera graculina*	Protected	Bird survey; Stag-watch survey; Opportunistic
Aves	Common Starling	*Sturnus vulgaris*	-	Bird survey

Class	Common name	Scientific name	BC Act status	Survey
Aves	Double-barred Finch	*Taeniopygia bichenovii*	Protected	Bird survey
Aves	European Blackbird	*Turdus merula*	-	Bird survey; Opportunistic
Mammalia	White-striped Mastiff Bat	*Austronomus australis*	Protected	Anabat® survey
Mammalia	Gould's Wattled Bat	*Chalinolobus gouldii*	Protected	Anabat® survey
Mammalia	Chocolate Wattled Bat	*Chalinolobus morio*	Protected	Anabat® survey
Mammalia	Fallow Deer	*Dama dama*	-	Nocturnal survey
Mammalia	**Eastern False Pipistrelle**	***Falsistrellus tasmaniensis***	**Vulnerable**	**Anabat® survey**
Mammalia	European Hare	*Lepus europaeus*	-	Opportunistic
Mammalia	Eastern Grey Kangaroo	*Macropus giganteus*	Protected	Nocturnal survey; Opportunistic
Mammalia	**Large Bent-winged Bat**	***Miniopterus orianae aceanensis***	**Vulnerable**	**Anabat® survey**
Mammalia	Southern Freetail Bat	*Mormopterus planiceps*	Protected	Anabat® survey
Mammalia	Eastern Freetail Bat	*Mormopterus ridei*	Protected	Anabat® survey
Mammalia	Unidentified Long-eared Bat	*Nyctophilus sp.*	Protected	Anabat® survey
Mammalia	European Rabbit	*Oryctolagus cuniculus*	-	Nocturnal survey; Opportunistic
Mammalia	Rusa Deer	*Rusa timorensis*	-	Nocturnal survey; Opportunistic
Mammalia	Feral Pig	*Sus* sp.	-	Opportunistic
Mammalia	Common Brushtail Possum	*Trichosurus vulpecula*	-	Nocturnal survey; Stag-watch survey
Mammalia	Large Forest Bat	*Vespadelus darlingtoni*	Protected	Anabat® survey
Mammalia	Little Forest Bat	*Vespadelus vultumus*	Protected	Anabat® survey
Mammalia	Southern Forest Bat	*Vespadelus regulus*	Protected	Anabat® survey
Mammalia	Red Fox	*Vulpes vulpes*	-	Nocturnal survey
Mammalia	Common Wombat	*Vombatus ursinus*	Protected	Nocturnal survey; Opportunistic
Mammalia	Unidentified microbat	-	Protected	Nocturnal survey; Stag-watch survey
Reptilia	Jacky Dragon	*Amphibolurus muricatus*	Protected	Opportunistic
Reptilia	Delicate Skink	*Lampropholis delicata*	Protected	Pink-tailed Legless Lizard survey

Class	Common name	Scientific name	BC Act status	Survey
Reptilia	Boulenger's Skink	*Morethia boulengeri*	Protected	Pink-tailed Legless Lizard survey
Reptilia	Eastern Brown Snake	*Pseudonaja textilis*	Protected	Opportunistic
Reptilia	Three-toe Skink	*Saiphos equalis*	Protected	Pink-tailed Legless Lizard survey

Appendix E. Fly By Night Bat Surveys Pty Ltd Anabat® analysis

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9th December 2018

Hi Sam

Following are the results for the files you sent for the sites at Jumping Creek, ACT.

Site	Date	A.au	M.pl	M.ri	C.go	C.mo	M.sc	V.da	V.re	V.vu	Total Passes
AB1	16/11/18	C	C	Po	C	C	P			C	49
AB1	17/11/18	C	C	Po	C	C	P			P	56
AB1	18/11/18	C	C		C			C		P	36
AB2	16/11/18		Po		C						10
AB2	17/11/18		Po							P	9
AB2	18/11/18	C	C		C	C	C	C	P	C	329

Species

A.au	White-striped Mastiff Bat	*Austronomus australis*	**M.pl**	Southern Freetail Bat	*Mormopterus planiceps*
M.ri	Southern Freetail Bat	*Mormopterus ridei*	**C.go**	Gould's Wattled Bat	*Chalinolobus gouldii*
C.mo	Chocolate Wattled Bat	*Chalinolobus morio*	**M.sc**	Eastern Bent-wing Bat	*Miniopterus schreibersii oceanensis*
V.da	Large Forest Bat	*Vespadelus darlingtoni*	**V.re**	Southern Forest Bat	*Vespadelus regulus*
V.vu	Little Forest Bat	*Vespadelus vulturnus*			

Confidence of Identification

C	Confident	**P**	Probable	**Po**	Possible

Best wishes

Glenn Hoye

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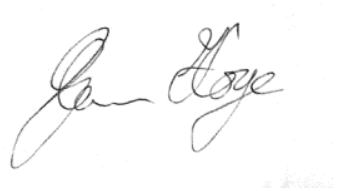
26th January 2020

Hi Shannon

Following are the results for the files you sent for the sites at Jumping Creek, near Queanbeyan, NSW. There were no files that could be attributed to the Fishing Bat (*Myotis macropus*).

Best wishes



Glenn Hoye

Site	Date	A.au	M.pl	M.ri	C.go	C.mo	F.ta	M.or	M.ma	N.sp	V.da	V.vu	Total Identifiable Passes
L1	28/11/2019	C	C	C	C	C	C			C		C	164
L1	29/11/2019		C	C	C	C					C	C	183
L1	30/11/2019		C	C	C	C				C		C	31
L1	1/12/2019					C							2
L1	2/12/2019			P									1
L1	3/12/2019		C	C	C	C	C					C	29
L1	4/12/2019		C	C	C	C				P		C	66
L1	5/12/2019	C	C	C	C	C		C			C	C	222
L1	6/12/2019	C	C	C	C	C	C	C				C	86
L2	28/11/2019	C	C	C		P	1	P			C		21
L2	29/11/2019	C	C	C	C	C	C	P			C	C	121
L2	30/11/2019	C	C	C	C	C					C	C	29
L2	1/12/2019		C	C	C								8
L2	2/12/2019											Po	1
L2	3/12/2019		C	C	C	C		C				C	51
L2	4/12/2019	C	C	C	C	C		C				C	44
L2	5/12/2019	C	C	C	C	C		C		C	C	C	83
L2	6/12/2019	C	C	C	C	C					C	C	70

Species

A.au	White-striped Mastiff Bat	*Austronomus australis*	
M.ri	Eastern Freetail Bat	*Mormopterus ridei*	
C.mo	Chocolate Wattled Bat	*Chalinolobus morio*	
M.or	Eastern Bent-wing Bat	*Miniopterus oraniae oceanensis*	
N.sp	Unidentified Long-eared Bat	*Nyctophilus sp.*	
V.vu	Little Forest Bat	*Vespadelus vulturnus*	
M.pl	Southern Freetail Bat	*Mormopterus planiceps*	
C.go	Gould's Wattled Bat	*Chalinolobus gouldii*	
F.ta	Eastern Falsistrelle	*Falsistrellus tasmaniensis*	
M.ma	Fishing Bat	*Myotis macropus*	
V.da	Large Forest Bat	*Vespadelus darlingtoni*	

Confidence of Identification

C	Confident	**P**	Probable	**Po**	Possible

Appendix F. Likelihood of Occurrence

Key for below table

EPBC Act:

CE - critically endangered

E - endangered

V - vulnerable

CD - conservation dependent

BC Act:

CE1 - critically endangered species (Schedule 1, Part 1)

E1 - endangered species (Schedule 1, Part 2)

E2 - endangered population (Schedule 1, Part 2, Division 4)

E4 - presumed extinct (Schedule 3, Part 1)

V1 - vulnerable species (Schedule 2, Part 3)

Note: The brief species distribution and habitat descriptions provided in the below table are sourced / appropriated from the threatened species online profiles, listing determinations and/or recovery plans prepared for the species by the Commonwealth Government and NSW Government. These resources and associated references are provided on the relevant government websites.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Birds				
Anthochaera phrygia Regent Honeyeater	CE	CE1	A semi-nomadic species occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises a number of other eucalypt species. Nectar and fruit from the mistletoes *Amyema miquelii*, *A. pendula*, and *A. cambagei* are also eaten during the breeding season. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and sheoaks as well as within mistletoe haustoria (section of the root which connects with the host tree). An open cup-shaped nest is constructed by the female of bark, grass, twigs and wool.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Artamus cyanopterus cyanopterus Dusky Woodswallow	-	V1	The Dusky Woodswallow has two separate populations. The eastern population is found from Atherton Tableland, Queensland south to Tasmania and west to Eyre Peninsula, South Australia. The other population is found in south-west Western Australia. The Dusky Woodswallow is found in open forests and woodlands and may be seen along roadsides and on golf courses. The south-eastern population migrates north in autumn.	**Confirmed** Species was recorded in the study area during field surveys.
Botaurus poiciloptilus Australasian Bittern	E	E1	Australasian Bitterns are widespread but uncommon over south-eastern Australia. In NSW they may be found over most of the state except for the far north-west. Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.). Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails.	Negligible There is no potential habitat of significance for this species in the subject land.
Calidris ferruginea Curlew Sandpiper	CE	E	The Curlew Sandpiper is distributed around most of the Australian coastline. Inland records are probably mainly of birds pausing for a few days during migration. The Curlew Sandpiper breeds in Siberia and migrates to Australia (as well as Africa and Asia) for the non-breeding period, arriving in Australia between August and November, and departing between March and mid-April. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	Negligible There is no potential habitat of significance for this species in the subject land.
Callocephalon fimbriatum Gang-gang Cockatoo	-	V1	In summer the Gang-gang Cockatoo occupies tall montane forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. Also occur in subalpine Snow Gum woodland and occasionally in temperate or regenerating forest. In winter, the species occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. The Gang-gang Cockatoo usually breeds in tall forests in the Southern Tablelands region, however they have been observed on occasion to breed in Box-Gum Woodland and other similar lowland habitat around Canberra (R. Speirs pers. obs., M. Mulvaney pers. comm.).	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Calyptorhynchus lathami Glossy Black-cockatoo	-	V1	The Glossy Black-cockatoo has a patchy distribution, having once been widespread across most of the south-east of Australia. The species is now distributed throughout an area which extends from the coast near Eungella in eastern Queensland to Mallacoota in Victoria. Glossy black-cockatoos feed on casuarina seeds, however they occasionally consume seeds from eucalypts, angophoras, acacias and hakeas, as well as insect larvae. On the Southern Tablelands of the NSW and the ACT the species feeds almost exclusively on Drooping Sheoak *Allocasuarina verticillata*. Pairs mate for life and nest in the hollows of large, old living or dead eucalypt trees. Breeding occurs between March and August.	Low It is possible that the species may visit the subject land, however the subject land does not contain nesting resources or foraging resources of potential significance to the species.
Chthonicola sagittata Speckled Warbler	-	V1	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat includes scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant.	**Confirmed** EcoLogical Australia (2010) recorded the species in the study area. However, the subject land has been degraded to the extent that it does not contain nesting resources or foraging resources of potential significance to the species.
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	-	V1	In the region, Brown Treecreepers occur in dry woodlands and open forest below 1,000 metres. Brown Treecreepers also frequent paddocks and grasslands where there are sufficient logs, stumps and dead trees nearby. The species prefers relatively undisturbed woodland and dry open forest where the native understorey, especially grasses, has been preserved. The species usually prefers predominantly rough-barked trees such as Stringybarks and rough barked Boxes.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
Daphoenositta chrysoptera Varied Sittella	-	V1	The Varied Sittella occurs in a wide variety of woodland and forest habitats, particularly in lowland areas. The species prefers areas with a dominance of rough barked trees, notably Red Stringybark at relatively high density. The species is rarely recorded in sparsely treed areas.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Grantiella picta Painted Honeyeater	V	V1	The Painted Honeyeater is found in Queensland and New South Wales west of the Great Dividing Range, through to northern Victoria. The species displays some migratory movement and is occasionally found in the Northern Territory and is a vagrant to South Australia and the ACT. The species frequents eucalypt forests and woodlands, particularly those that are infested heavily with mistletoes.	**Confirmed** EcoLogical Australia (2010) recorded the species in the study area. However, the subject land has been degraded to the extent that it does not contain nesting resources or foraging resources of potential significance to the species.
Hieraaetus morphnoides Little Eagle	-	V1	The Little Eagle is distributed throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment, and occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. The species is sensitive to human disturbance.	Low The subject land is likely to be part of the large foraging range of a pair of Little Eagles, however no indications of breeding activity (i.e. large stick nests) were observed in the subject land or nearby during the survey.
Lathamus discolor Swift Parrot	CE	E1	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Low It is possible that the species may visit the subject land to feed on flowering eucalypts. The subject land does not contain foraging resources of potential significance to the species.
Melanodryas cucullata cucullata Hooded Robin (southeastern form)	-	V1	The Hooded Robin occupies drier eucalypt forest, woodland and scrub, grasses and low shrubs, as well as cleared paddocks with regrowth or stumps. The species uses stumps, posts or fallen timber from which to locate prey on the ground. The species is found in woodland, often with scattered Yellow Box and/or Blakely's Red Gum, with long grass and low shrubs, or fallen logs.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
Petroica boodang Scarlet Robin	-	V1	The Scarlet Robin is found in south-eastern Australia (extreme south-east Queensland to Tasmania, western Victoria and south-east South Australia) and south-west Western Australia. In NSW it occupies open forests and woodlands from the coast to the inland slopes, breeding in drier eucalypt forests and temperate woodlands.	**Confirmed** Species was recorded foraging in the study area during field surveys.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Petroica phoenica Flame Robin	-	V1	The Flame Robin is found in south-eastern Australia, from the Queensland border to Tasmania, western Victoria and south-east South Australia. In NSW it breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. The species migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.
Numenius Madagascariensis Eastern Curlew	CE	-	The eastern curlew is Australia's largest shorebird and a long-haul flyer. The eastern curlew takes an annual migratory flight to Russia and north-eastern China to breed, arriving back home to Australia in August to feed on crabs and molluscs in intertidal mudflats. It is extremely shy and will take flight at the first sign of danger.	Negligible There is no potential habitat for this species in the subject land.
Polytelis swainsonii Superb Parrot	V	V1	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant vegetation. Breeds in hollow branches of tall eucalypt trees within nine kilometres of feeding areas.	Low The species was not observed in the subject land or nearby during the field surveys, however it is possible that the species may visit the subject land to forage. It is unlikely that Superb Parrots would breed in the remnant trees in the subject land. The subject land does not contain foraging resources of potential significance to the species.
Rostratula australis Australian Painted Snipe	V	E1	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. The species prefers freshwater wetlands, ephemeral or permanent, although it has been recorded in brackish waters.	Negligible There is no potential habitat of significance for this species in the subject land.
Stagonopleura guttata Diamond Firetail	-	V1	The Diamond Firetail is found in eastern Australia, from Eyre Peninsula, South Australia, to south-eastern Queensland. There has been a decline in density throughout the range, and many remaining populations may now be isolated. The species inhabits a wide range of eucalypt-dominated vegetation communities that have a grassy understorey, including woodland and mallee.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Fish and Crustacea				
Maccullochella peelii Murray Cod	V	-	The Murray Cod's natural distribution extends throughout the Murray-Darling basin ranging west of the divide from south east Queensland, through NSW into Victoria and South Australia. The species is found in the waterways of the Murray– Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers, billabongs and large deep holes. Murray Cod is entirely a freshwater species and will not tolerate high salinity levels.	Negligible There is no potential habitat in the subject land for the species.
Macquaria australasica Macquarie Perch	E	E1	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their substantial tributaries.	Negligible There is no potential habitat in the subject land for the species.
Bidyanus bidyanus Silver Perch	CE	V1	Silver perch are endemic to the Murray-Darling system (including all states and sub-basins). They show a general preference for faster-flowing water, including rapids and races, and more open sections of river, throughout the Murray-Darling Basin. Silver perch are a highly migratory freshwater fish. The extensive migration of adults, particularly during flooding, has long been recognised and is considered to be part of their spawning behaviour.	Negligible There is no potential habitat in the study area for this species.
Frogs				
Litoria aurea Green and Golden Bell Frog	V	E1	The Green and Golden Bell Frog occurs mainly along coastal lowland areas of eastern NSW and Victoria. The furthest inland record of the species is at a recently discovered population near Hoskinstown in the Southern Tablelands (referred to as the Molonglo population). The species was previously known from elsewhere in the Southern Tablelands but is now considered to have disappeared from the ACT and central slopes around Bathurst. In NSW, the species commonly occupies disturbed habitats, and breeds largely in ephemeral ponds. However, in Victoria, the Green and Golden Bell Frog occupies habitats with little human disturbance and commonly breeds in permanent ponds, as well as ephemeral ponds.	Negligible The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Litoria booroolongensis Booroolong Frog	E	-	The Booroolong Frog is restricted to tablelands and slopes in NSW and north-east Victoria at 200–1300 m above sea level. The species is predominantly found along the western-flowing streams and their headwaters of the Great Dividing Range, and a small number of eastern-flowing streams in the north end of its range. The Booroolong Frog occurs along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins, or near slow-flowing connected or isolated pools that contain suitable rock habitats. Streams range from small slow-flowing creeks to large rivers in dissected mountainous country, tablelands, foothills and lowland plains. Primary habitat requirements for the Booroolong Frog are extensive rock bank structures along permanent rivers. The species can occur in cleared grazing land and pasture.	Negligible The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.
Litoria castanea Yellow-spotted Tree Frog	E	-	The Yellow-spotted Tree Frog previously had a disjunct distribution, being recorded on the New England Tablelands and on the Southern Tablelands from Lake George to Bombala. The species has only recently (2010) been rediscovered on the Southern Tablelands. Prior to this the species had not been recorded on the Southern Tablelands since the 1970s. Found in large permanent ponds, lakes and dams with an abundance of bulrushes and other emergent vegetation, it shelters during autumn and winter under fallen timber, rocks, other debris or thick vegetation.	Negligible The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.
Litoria raniformis Growling Grass Frog	V	E1	In NSW, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral swamps or billabongs with an abundance of bulrushes and other emergent vegetation along floodplains and river valleys. The species has also been found in irrigated rice crops. Outside the breeding season animals disperse away from water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks. The species previously occurred on the Southern Tablelands at a number of sites within the Murrumbidgee River corridor, however it is now widely considered to have become extinct on the Southern Tablelands.	Negligible The species is not known to occur near the study area, and the ephemeral creek systems are unlikely to provide potential habitat for the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Insects				
Synemon plana Golden Sun Moth	CE	E1	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species occurs in Natural Temperate Grasslands and Box-Gum Grassy Woodland in which the groundcover is dominated by Wallaby Grasses (*Rytidosperma* spp.). It is believed that the females lay up to 200 eggs at the base of the Wallaby Grass tussocks. After hatching, the larvae tunnel underground where they remain feeding on the roots of Wallaby Grass tussocks. The species is also known to feed on the introduced species (and Weed of National Significance), Chilean Needle Grass *Nassella neesiana*.	Negligible There is no potential habitat in the subject land for the species.
Mammals				
Chalinolobus dwyeri Large-eared Pied Bat	V	V1	The Large-eared Pied Bat appears to exist in a number of small populations throughout its range. Very few maternity sites are known. The species requires a combination of sandstone cliff/escarpment to provide roosting habitat that is adjacent to higher fertility sites, particularly box gum woodlands or river/rainforest corridors which are used for foraging.	Low The species is not known to occur near the study area and was not recorded during Anabat® bat surveys.
Dasyurus maculatus maculatus Spot-tailed Quoll (SE mainland population)	E	V1	The Spot-tailed Quoll occurs along the east coast of Australia and the Great Dividing Range. The species uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests. Occasional sightings have been made in open country, grazing lands, rocky outcrops and other treeless areas. Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage. Seventy per cent of the diet is medium-sized mammals, and also feeds on invertebrates, reptiles and birds. Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 ha and 1000ha, while males have larger home ranges of between 2000 ha and 5000ha. Breeding occurs from May to August.	Low The degradation and proximity to human settlements make the subject land unlikely to contain nesting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Miniopterus schreibersii oceanensis Eastern Bent-wing Bat	-	V1	The Eastern Bentwing Bat is a subspecies of the Common Bentwing Bat, with a range thought to be from central Victoria to Cape York Peninsula, Queensland. It is a fast flyer, able to travel many kilometres in a night. Caves are the primary roosting habitat for this species however similar man-made structures are also used (culverts, eaves etc.). The species forages above the forest canopy.	**Confirmed** Species was confirmed foraging in the study area via Anabat® bat surveys. However, the subject land does not contain potential roosting and/or breeding habitat (caves, mines, water tunnels, etc.).
Petauroides Volans Greater Glider	V	-	The greater glider is restricted to eastern Australia, occurring from the Windsor Tableland in north Queensland through to central Victoria, with an elevational range from sea level to 1200 m above sea level. The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, and is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species	Negligible There is no suitable habitat in the subject land for the species, and the species is not known to occur in the locality.
Petrogale penicillata Brush-tailed Rock-wallaby	V	E1	In NSW they occur from the Queensland border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. They occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing north. They browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	Negligible There is no suitable habitat in the subject land for the species, and the species is not known to occur in the locality.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Phascolarctos cinereus Koala (combined populations of Qld, NSW and the ACT)	V	V1	In NSW, the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. They are solitary with varying home ranges. In high quality habitat home ranges may be 1-2 hectare and overlap, while in semi-arid country they are usually discrete and around 100 ha.	Low The species is known to occur in the locality and could forage within the more intact portions of the study area (i.e. PCT1093 Zone 1 and PCT1334 Zone 1). However, no evidence of the Koala was detected (e.g. scats, scratch marks). In addition, the vegetation in the subject land (i.e. the proposed development footprint) has been degraded to the degree that it is unlikely to provide habitat of significance for the species.
Pteropus poliocephalus Grey-headed Flying Fox	V	V1	The Grey-headed Flying Fox occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. Whilst Brisbane, Newcastle, Sydney and Melbourne are occupied continuously, the species is widespread throughout their range during summer. In autumn the species occupies coastal lowlands and is uncommon inland. In winter the species congregates in coastal lowlands north of the Hunter Valley and is occasionally found on the south coast of NSW and on the northwest slopes (associated with flowering eucalypts of these areas). The Grey-headed Flying-fox requires foraging resources and roosting sites. It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. The Grey-headed Flying-fox roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. The roost at Commonwealth Park in Canberra is the only known roost in the ACT region.	Low It is possible that the species may visit the subject land to forage. The subject land does not contain roosting resources or foraging resources of potential significance to the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Reptiles				
Aprasia parapulchella Pink-tailed Legless Lizard	V	V	The Pink-tailed Legless Lizard is a fossorial species which lives beneath surface rocks and occupies ant burrows. It feed on ants, particularly their eggs and larvae. Thought to lay eggs within the ant nests under rocks that it uses as a source of food and shelter and for thermoregulation. Key habitat features are a cover of native grasses, particularly Kangaroo Grass, sparse or no tree cover, little or no leaf litter, and scattered small rock with shallow embedment in the soil surface.	Negligible An extensive rock turning survey did not record the species in the subject land or study area.
Delma impar Striped Legless Lizard	V	V1	The Striped Legless Lizard is patchily distributed in grasslands of south-eastern NSW, the ACT, north-eastern, central and south-western Victoria, and south-eastern South Australia. Most areas where the species persists are thought to have had low to moderate levels of agricultural disturbance in the past and it has been suggested that ploughing in particular may be incompatible with the survival of the species. Until recently, the species was thought to inhabit only native grasslands dominated by species such as Tall Speargrass and Kangaroo Grass. In recent years, surveys have revealed the Striped Legless Lizard in many sites dominated by exotic grasses such as Phalaris, Serrated Tussock and Flatweed. They have also been found in several secondary grassland sites, generally within two kilometres of primary grassland.	Negligible The study area does not support potential habitat for this species.
Tympanocryptis pinguicolla Grassland Earless Dragon	E	E	In the Canberra-Monaro region the Grassland Earless Dragon is restricted to Natural Temperate Grassland that is dominated by perennial tussock-forming species. It is known to make use of grass tussocks as well as small holes in the ground that are also used by invertebrates such as wolf spiders and crickets. The species is known to occur in suitable native grassland habitat in the Majura and Jerrabomberra valleys in the ACT and at 'Letchworth' near Queanbeyan in NSW.	Negligible The study area does not support potential habitat for this species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Varanus rosenbergi Rosenberg's Goanna	-	V1	Rosenberg's Goanna is a medium to large monitor species occurring in southern parts of Western Australia and South Australia, with isolated populations in Victoria and New South Wales. In NSW it has been recorded from coastal areas around Sydney and further south, and west to Mount Victoria and the Namadgi and Kosciusko national parks. The species is found in a range of habitats including coastal heaths, humid woodlands and both wet and dry sclerophyll forests, preferring eucalyptus woodlands and heathland. Termite mounds are a critical habitat component and are used for egg incubation.	Low The species is known to occur in the locality and could forage within the more intact portions of the study area (i.e. PCT1093 Zone 1 and PCT1334 Zone 1). These intact areas contain termite mounds, which are a vital nesting resource for the species. In contrast, the vegetation in the subject land (i.e. the proposed development footprint) has been degraded to the degree that it is unlikely to provide habitat of significance for the species. This is reflected in the paucity of termite mounds in the subject land.
Plants				
Acacia bynoeana Bynoe's Wattle	V	E1	Bynoe's wattle is found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. The species is currently known from about 30 locations, with the size of the populations at most locations being very small (1-5 plants). The species occurs in heath or dry sclerophyll forest on sandy soils. It seems to prefer open, sometimes slightly disturbed sites such as trail margins, edges of roadside spoil mounds and in recently burnt patches. Associated overstorey species include Red Bloodwood, Scribbly Gum, Parramatta Red Gum, Saw Banksia and Narrow-leaved Apple.	Low The species is not known to occur in the locality and was not recorded during surveys.
Caladenia actensis Canberra Spider Orchid	CE	E	This orchid is endemic to the ACT and is only known from two populations on the western lower slopes of Mount Ainslie and Mount Majura. It was previously recorded at Aranda and Campbell, but no longer exists at those locations. The Canberra Spider Orchid grows on shallow, gravelly, brown clay loam soils. The species occurs amongst a groundcover of grasses, forbs and low shrubs, often among rocks. It grows on the transition zone (ecotone) between grassy woodland and dry sclerophyll forest.	Negligible There is no potential habitat in the study area for the species.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Caladenia tessellata Thick-lipped Spider-orchid	V	E1	Known from the Sydney area (old records), Wyong, Ulladulla and Braidwood in NSW. Populations in Kiama and Queanbeyan are presumed extinct. It was also recorded in the Huskisson area in the 1930s. The species occurs on the coast in Victoria from east of Melbourne to almost the NSW border. Generally found in grassy sclerophyll woodland on clay loam or sandy soils, though the population near Braidwood is in low woodland with stony soil.	Negligible The vegetation in the subject land has been heavily grazed and degraded to the degree that it is unlikely to provide potential habitat for the species.
Dodonaea procumbens Trailing Hop-bush	V	V	Trailing Hop-bush is found in the dry areas of the Monaro, between Michelago and Dalgety where it occurs mostly in Natural Temperate Grassland or Snow Gum *Eucalyptus pauciflora* Woodland. A single known population occurs at Lake Bathurst (the northern-most occurrence of the species) where it occurs adjacent to the lake bed in grassland dominated by Corkscrew Grass *Austrostipa scabra* and Curly Sedge *Carex bichenoviana*. The species grows on sandy-clay soils in open bare patches where there is little competition from other species. The species often occurs on roadside batters and does not persist in heavily grazed pastures.	Negligible The species is not known to occur in the locality and was not recorded during surveys.
Eucalyptus aggregata Black Gum	V	V1	Black Gum occurs on the central and southern tablelands of NSW, and in a small disjunct population in Victoria. In NSW, it occurs predominantly in the South Eastern Highlands Bioregion. The species is a small to medium-sized woodland tree which grows in grassy woodlands on alluvial soils in moist sites along creeks on broad, cold and poorly-drained flats and hollows. It commonly occurs with Candlebark *Eucalyptus rubida*, Ribbon Gum *E. viminalis*, and Snow Gum *E. pauciflora*, with a grassy understorey of River Tussock *Poa labillardieri*. Most populations are located on private land or road verges and travelling stock routes.	Negligible The species was not recorded during surveys.
Eucalyptus macarthurii Camden Woollybutt / Paddys River Box	E	E1	The species is currently recorded from the Moss Vale District to Kanangra Boyd National Park. In the Southern Highlands it occurs mainly on private land, often as isolated individuals in, or on the edges, of paddocks. Isolated stands occur in the north west part of the range on the Boyd Plateau. The only known record in the conservation estate is within Kanangra Boyd National Park. The species occurs on grassy woodland on relatively fertile soils on broad cold flats.	Negligible The species is not known to occur in the locality and was not recorded during surveys.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Haloragis exalata subsp. *Exalata* Wingless Raspwort / Square Raspwort	V	V1	Square Raspwort occurs in 4 widely scattered localities in eastern NSW. It is disjunctly distributed in the Central Coast, South Coast and North Western Slopes botanical subdivisions of NSW. Square Raspwort appears to require protected and shaded damp situations in riparian habitats. Flowering specimens in NSW are recorded from November to January.	Negligible The species is not known to occur in the locality and was not recorded during surveys.
Kunzea cambagei Cambage Kunzea	V	V1	*Kunzea cambagei* occurs in the western and southern parts of the Blue Mountains, NSW, with four main populations with 20–150 individuals. *Kunzea cambagei* occurs in wet heath and woodland on coarse sandy soil on sandstone and quartzite.	Negligible The species is not known to occur in the locality and was not recorded during surveys.
Lepidium hyssopifolium Basalt Peppercress	E	E	This species is known from a few populations in NSW, Victoria and Tasmania. The Basalt Pepper-cress is known to establish on open, bare ground with limited competition from other plants. It was previously recorded from Eucalypt woodland with a grassy ground cover, low open Casuarina woodland with a grassy ground cover and tussock grassland. Recently recorded localities have predominantly been in weed-infested areas of heavy modification, high degradation and high soil disturbance such as road and rail verges, on the fringes of developed agricultural land or within small reserves in agricultural land. Many populations are now generally found amongst exotic pasture grasses and beneath exotic trees.	Low The species is not known to occur in the locality and was not recorded during surveys.
Lepidium ginninderrense Ginninderra Peppercress	V	E	The species is known from two natural sites in northern ACT, both within Natural Temperate Grassland.	Negligible There is no potential habitat in the study area for the species.
Leucochrysum albicans var. *tricolor* Hoary Sunray	E	-	The Hoary Sunray occurs from Queensland to Victoria and in Tasmania. In the ACT the species can be seen in spring in abundance on the roadside along Fairbairn Avenue and into Mt Ainslie Nature Reserve, on the western slopes of Mt Majura and adjacent to the Federal Highway road easement. In NSW it is distributed on the inland slopes and plains including grasslands and woodlands on the Monaro and is quite a common species along in less modified areas. The species is usually found in ungrazed and lightly grazed areas, along roadsides in particular. It appears to be very sensitive to grazing but responds to disturbance as a coloniser and appears to tolerate mowing. Flowers spring to summer.	**Confirmed** EcoLogical Australia (2010) recorded the species in the study area but not in the subject land (i.e. proposed development footprint).

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Pelargonium subsp. *Striatellum* Omeo Stork's-bill	E	E1	An undescribed species of Pelargonium, Omeo Stork's Bill is a tufted perennial herb threatened by grazing, recreational activities, and exotic species. It is known to occur just above the high-water level of ephemeral lakes in NSW and Victoria.	Negligible There is no potential habitat in the subject land for the species.
Pomaderris pallida Pale Pomaderris	V	V1	Pale Pomaderris has been recorded from near Kydra Trig, north-west of Nimmitabel, Tinderry Nature Reserve, and the Queanbeyan River. A record from Byadbo in Kosciuszko National Park has not been relocated. The main distribution is along the Murrumbidgee in the ACT. It was recorded recently in eastern Victoria. This species usually grows in shrub communities surrounded by Brittle Gum *Eucalyptus mannifera* and Red Stringybark *E. macrorhynca* or Black Cypress *Callitris endlicheri* woodland.	Low The species is known to occur in the locality. However, it is conspicuous when present and was not recorded during surveys.
Prasophyllum petilum Tarengo Leek Orchid	E	E1	When first described in 1991, the Tarengo Leek Orchid was known only from the Hall Cemetery in the ACT. It has since been found at four sites in New South Wales: Captains Flat Cemetery, Ilford Cemetery, Steves Travelling Stock Route (TSR) at Delegate and the Tarengo TSR near Boorowa. The Tarengo Leek Orchid occurs on relatively fertile soils in grassy woodland or natural grassland. The three cemetery sites originally contained grassy woodland, dominated by Snow Gum *Eucalyptus pauciflora* and Black Gum *E. aggregata* at Captains Flat, and Blakely's Red Gum *E. blakelyi* and Yellow Box *E. melliodora* at Hall and Ilford. Both Tarengo TSR and Steves TSR are natural grasslands. The species is intolerant of grazing and this is considered to be the key reason it has been found only within cemeteries and TSRs, land from which grazing has been restricted.	Negligible The vegetation in the subject land has been degraded to the extent that it is unlikely to provide potential habitat for the species.
Pultenaea pedunculata Matted Bush-pea	-	E1	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.	Low The species is not known to occur in the locality and was not detected during surveys.

Species Name	EPBC Act Status	BC Act Status	Description (Distribution and Habitat)	Likelihood of Occurrence
Rutidosis Leptorrhynchoides Button Wrinklewort	E	E1	In the ACT and NSW, Button Wrinklewort occurs in box-gum woodland, secondary grassland derived from box-gum woodland or in natural temperate grassland. It prefers open spaces where it does not have to compete for light. It is known from several sites in the ACT, NSW and Victoria, where it is threatened by habitat loss, grazing and weed encroachment.	Low The species is known to occur in the locality. However, the it is conspicuous when present and was not detected during surveys.
Swainsona sericea Silky Swainson-pea	-	V1	Silky Swainson-pea is a low growing perennial, found from the Northern Tablelands to the Southern Tablelands and Monaro region as well as further inland on the slopes and plains. The species is found in Natural Temperate Grassland and Snow Gum Woodland on the Monaro, and in Box-Gum Woodland in the Southern Tablelands and South West Slopes.	Negligible The subject land is unlikely to provide potential habitat to the species due to land use history and degraded nature of the vegetation in the subject land.
Swainsona recta Small Purple-pea	E	E	The Small Purple-pea occurs in the grassy understorey of woodlands and open forests dominated by Blakely's Red Gum, Yellow Box, Candlebark and Bundy. The species grows in association with understorey dominants that include Kangaroo Grass, Poa tussocks and Spear-grasses. Plants die back in summer, surviving as rootstocks until they shoot again in autumn. The species is intolerant of grazing but generally tolerant of fire, which also enhances germination by breaking the seed coat and reducing competition from other species.	Negligible The subject land is unlikely to provide potential habitat to the species due to land use history and degraded nature of the vegetation in the subject land.
Thesium austral Austral Toadflax	V	-	Found in very small to large populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. Austral Toadflax is a root parasite that takes water and some nutrients from other plants, especially Kangaroo Grass. It is often found in damp sites in association with Kangaroo Grass but it is also found on other grass species at inland sites. Occurs on clay soils in grassy woodlands or coastal headlands.	Negligible There is no potential habitat in the subject land for the species.

Appendix G. BAM summary reports

BAM Vegetation Zones Report

Proposal Details

Assessment Id	Assessment name	BAM data last updated *
00018973/BAAS17089/20/00018974	2794 - Jumping Creek Estate - BDAR version 2 - RFI additions	10/06/2021
Assessor Name	**Report Created**	**BAM Data version ***
	29/06/2021	45
Assessor Number	**Assessment Type**	**BAM Case Status**
	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
1	29/06/2021	

* 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	1093_Zone_1	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	Zone_1	1.48	1	
2	1093_Zone_2	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	Zone_2	2.93	2	
3	1334_Zone_1	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion	Zone_1	0.85	1	
4	1334_Zone_2	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion	Zone_2	1.98	1	

BAM Predicted Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018973/BAAS17089/20/00018974	2794 - Jumping Creek Estate - BDAR version 2 - RFI additions	10/06/2021
Assessor Name	**Report Created**	**BAM Data version ***
	29/06/2021	45
Assessor Number	**Assessment Type**	**BAM Case Status**
	Part 4 Developments (General)	Finalised
Assessment Revision	**BOS entry trigger**	**Date Finalised**
1		29/06/2021

* 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	Ninox connivens	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Brown Treecreeper (eastern subspecies)	Climacteris picumnus victoriae	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Diamond Firetail	Stagonopleura guttata	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Dusky Woodswallow	Artamus cyanopterus cyanopterus	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion

Dusky Woodswallow	Artamus cyanopterus cyanopterus	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Eastern False Pipistrelle	Falsistrellus tasmaniensis	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Flame Robin	Petroica phoenicea	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Gang-gang Cockatoo	Callocephalon fimbriatum	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Grey-headed Flying-fox	Pteropus poliocephalus	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
Hooded Robin (south-eastern form)	Melanodryas cucullata cucullata	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Koala	Phascolarctos cinereus	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Large Bent-winged Bat	Miniopterus orianae oceanensis	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion

Large Bent-winged Bat	Miniopterus orianae oceanensis	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Little Eagle	Hieraaetus morphnoides	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Little Lorikeet	Glossopsitta pusilla	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Little Whip Snake	Suta flagellum	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Painted Honeyeater	Grantiella picta	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Powerful Owl	Ninox strenua	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
Regent Honeyeater	Anthochaera phrygia	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Rosenberg's Goanna	Varanus rosenbergi	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion

Scarlet Robin	Petroica boodang	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Speckled Warbler	Chthonicola sagittata	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Spotted Harrier	Circus assimilis	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Spotted-tailed Quoll	Dasyurus maculatus	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Square-tailed Kite	Lophoictinia isura	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Swift Parrot	Lathamus discolor	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Turquoise Parrot	Neophema pulchella	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Varied Sittella	Daphoenositta chrysoptera	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion

Varied Sittella	Daphoenositta chrysoptera	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
White-throated Needletail	Hirundapus caudacutus	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion
		1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion
Yellow-bellied Glider	Petaurus australis	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion

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

Common Name	Scientific Name	Plant Community Type(s)
Glossy Black-Cockatoo	Calyptorhynchus lathami	1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion

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
Glossy Black-Cockatoo	Calyptorhynchus lathami	Habitat constraints

BAM Candidate Species Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018973/BAAS17089/20/00018974	2794 - Jumping Creek Estate - BDAR version 2 - RFI additions	10/06/2021
Assessor Name	**Report Created**	**BAM Data version ***
	29/06/2021	45
Assessor Number	**Assessment Type**	**BAM Case Status**
	Part 4 Developments (General)	Finalised
Assessment Revision	**Date Finalised**	**BOS entry trigger**
1	29/06/2021	

* 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
Aprasia parapulchella Pink-tailed Legless Lizard	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Caladenia tessellata Thick Lip Spider Orchid	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?
Callocephalon fimbriatum Gang-gang Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Dillwynia glaucula Michelago Parrot-pea	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?
Leucochrysum albicans var. tricolor Hoary Sunray	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Myotis macropus Southern Myotis	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☑ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Ninox strenua Powerful Owl	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☑ Nov ☐ Dec ☑ Survey month outside the specified months?

Pomaderris pallida Pale Pomaderris	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Rutidosis leptorrhynchoides Button Wrinklewort	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?
Zieria citriodora Lemon Zieria	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☑ Jul ☐ Aug ☑ Sep ☐ Oct ☑ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Brush-tailed Phascogale	Phascogale tapoatafa	Habitat degraded
Buttercup Doubletail	Diuris aequalis	Habitat degraded Geographic limitations
Creeping Hop-bush	Dodonaea procumbens	Refer to BAR
Eastern Pygmy-possum	Cercartetus nanus	Habitat degraded
Giant Burrowing Frog	Heleioporus australiacus	Refer to BAR
Glossy Black-Cockatoo	Calyptorhynchus lathami	Refer to BAR
Golden Sun Moth	Synemon plana	Habitat degraded Geographic limitations
Greater Glider	Petauroides volans	Refer to BAR
Grey-headed Flying-fox	Pteropus poliocephalus	Habitat constraints
Koala	Phascolarctos cinereus	Habitat constraints

Large Bent-winged Bat	Miniopterus orianae oceanensis	Habitat constraints
Long-nosed Potoroo	Potorous tridactylus	Refer to BAR
Regent Honeyeater	Anthochaera phrygia	Habitat constraints
Silky Swainson-pea	Swainsona sericea	Habitat degraded
Silver-leafed Gum	Eucalyptus pulverulenta	Refer to BAR
Small Purple-pea	Swainsona recta	Habitat degraded
Square-tailed Kite	Lophoictinia isura	Habitat constraints
Squirrel Glider	Petaurus norfolcensis	Habitat degraded
Swift Parrot	Lathamus discolor	Habitat constraints

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018973/BAAS17089/20/00018974	2794 - Jumping Creek Estate - BDAR version 2 - RFI additions	10/06/2021
Assessor Name	Report Created	BAM Data version *
	29/06/2021	45
Assessor Number	BAM Case Status	Date Finalised
	Finalised	29/06/2021
Assessment Revision	Assessment Type	BOS entry trigger
1	Part 4 Developments (General)	

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion											
1	1093_Zone_1	Not a TEC	47.6	47.6	1.5			High Sensitivity to Potential Gain	1.75		31
2	1093_Zone_2	Not a TEC	9.5	9.5	2.9			High Sensitivity to Potential Gain	1.75		0
										Subtotal	**31**

Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion											
3	1334_Zone_1	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	48.7	48.7	0.85	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	26

4	1334_Zone_2	White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	31.2	31.2	2	Critically Endangered Ecological Community	Critically Endangered	High Sensitivity to Potential Gain	2.50	TRUE	39
										Subtotal	**65**
										Total	**96**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id 00018973/BAAS17089/20/00018974	Proposal Name 2794 - Jumping Creek Estate - BDAR version 2 - RFI additions	BAM data last updated * 10/06/2021
Assessor Name	Assessor Number	BAM Data version * 45
Proponent Names Peet Jumping Creek Pty Ltd, Peet Jumping Creek Pty Ltd	Report Created 29/06/2021	BAM Case Status Finalised
Assessment Revision 1	Assessment Type Part 4 Developments (General)	Date Finalised 29/06/2021
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.	

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	Critically Endangered Ecological Community	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

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
1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	Not a TEC	4.4	31	0	31

BAM Biodiversity Credit Report (Like for like)

1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	1093_Zone_1	Yes	31	Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	1093_Zone_2	No	0	Monaro, Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

BAM Biodiversity Credit Report (Like for like)

Credit Retirement Options

Like-for-like credit retirement options

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00018973/BAAS17089/20/00018974

Proposal Name
2794 - Jumping Creek Estate - BDAR version 2 - RFI additions

BAM data last updated *
10/06/2021

Assessor Name

Assessor Number

BAM Data version *
45

Proponent Name(s)
Peet Jumping Creek Pty Ltd, Peet Jumping Creek Pty Ltd

Report Created
29/06/2021

BAM Case Status
Finalised

Assessment Revision
1

Assessment Type
Part 4 Developments (General)

Date Finalised
29/06/2021

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.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highla	Critically Endangered Ecological Community	1334-Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

BAM Biodiversity Credit Report (Variations)

PCT
No Changes

Predicted Threatened Species Not On Site

Name
Calyptorhynchus lathami / Glossy Black-Cockatoo

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
1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	Not a TEC	4.4	31	0	31.00

1093-Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	1093_Zone_1	Yes	31	Monaro,Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Southern Tableland Dry Sclerophyll Forests This includes PCT's: 299, 349, 351, 352, 653, 701, 727, 728, 730, 888, 957, 1093, 1177	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	1093_Zone_2	No	0	Monaro,Bungonia, Crookwell, Kybeyan-Gourock, Monaro, Murrumbateman, Snowy Mountains and South East Coastal Ranges. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Dry Sclerophyll Forests (Shrubby sub-formation)	Tier 3 or higher threat status	1093_Zone_1	Yes (including artificial)	31	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 (Shrubby sub-formation)	Tier 3 or higher threat status	1093_Zone_2	No	0	IBRA Region: South Eastern Highlands, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

No Species Credit Data

Credit Retirement Options

Like-for-like options

Biodiversity payment summary report

Assessment Id	Payment data version	Assessment Revision	Report created
00018973/BAAS17089/20/00018974		1	29/06/2021

Assessor Name	Assessor Number	Proposal Name	BAM Case Status
		2794 - Jumping Creek Estate - BDAR version 2 - RFI additions	Finalised

Assessment Type	Date Finalised	BOS entry trigger
Part 4 Developments (General)	29/06/2021	

PCT list

Price calculated	PCT common name	Credits
Yes	**1093 -** Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	31
Yes	**1334 -** Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion	65

Species list

Price calculated	Species	Credits

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

Biodiversity payment summary report

IBRA sub region	PCT common name	Threat status	Offset trading group	Risk premium	Administrative cost	Methodology adjustment factor	Price per credit	No. of ecosystem credits	Final credits price
Monaro	**1093 -** Red Stringybark - Brittle Gum - Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	No	Southern Tableland Dry Sclerophyll Forests >=50% and <70%	20.69%	$159.41	3.0383	$4,969.29	31	$154,047.85
Monaro	**1334 -** Yellow Box grassy woodland of the northern Monaro and Upper Shoalhaven area, South Eastern Highlands Bioregion	No	Southern Tableland Grassy Woodlands >90%	20.69%	$134.31	0.7822	$4,186.78	65	$272,140.56

Subtotal (excl. GST)	**$426,188.41**
GST	**$42,618.84**
Total ecosystem credits (incl. GST)	**$468,807.25**

Species credits for threatened species

Species profile ID	Species	Threat status	Price per credit	Risk premium	Administrative cost	No. of species credits	Final credits price

Biodiversity payment summary report

No species available

Grand total	**$468,807.25**