Picton Road upgrade between Nepean River and Almond Street, Wilton

Review of Environmental Factors

Appendix C

Biodiversity Assessment Report

C

Transport for NSW

Transport for NSW

Biodiversity assessment report for REF

Picton Road upgrade between Nepean River and Almond Street, Wilton

PRUP1S2C-GHD-0095-EN-RPT-000007

22 January 2024

NSW GOVERNMENT

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Table of contents

List of tables

List of figures

Executive summary

Transport for NSW (Transport) proposes to upgrade Picton Road between the Nepean River and Almond Street in Wilton, NSW (the proposal). The proposal includes upgrading the section of Picton Road from about 1.3 kilometres east of the bridge over the Nepean River to about 200 metres east of Almond Street, including the M31 Hume Motorway interchange.

The proposal is subject to assessment by a review of environmental factors (REF) under Division 5.1 of Environmental Planning and Assessment Act 1979 (EP&A Act). A biodiversity assessment report (BAR) has been prepared as part of the REF in accordance with the *Biodiversity Assessment Method* (DPIE 2020) to assess the potential impacts of constructing and operating the proposal on ecological values.

The proposal is located within land assessed under *The Cumberland Plain Conservation Plan* (CPCP) (DPE 2022a). The BAR assesses impacts to 'Excluded' and 'Avoided' land under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act) and impacts on 'Certified – Urban Capable Land' under the EPBC Act only. On 17 August 2022, strategic biodiversity certification was conferred under Section 8.2 of the BC Act upon 11,165 hectares of land as 'Certified – Urban Capable Land' or 'Certified – Major Transport Corridor' under the *Order Conferring Strategic Biodiversity Certification - Cumberland Plain Conservation Plan* (NSW Government Gazette 2022). As a result, portions of the proposal site are designated as Certified – Urban Capable Land, Excluded Land and/or Avoided Land under CPCP (DPE 2022a) and the associated Biodiversity Certification Order. Assessment under the BC Act is not required for areas mapped as 'Certified – Urban Capable Land' under the CPCP. However, assessment under the EPBC Act is still required for impacts to listed entities that occur on areas mapped as 'Certified – Urban Capable Land' under the CPCP as Commonwealth approval of the strategic assessment component of the CPCP is still pending.

The proposal will impact on the following land categories under the CPCP:

- Avoided Land: up to 0.01 ha
- Excluded Land: up to 76.93 ha
- Certified - Urban Capable Land: up to 34.54 ha, including 3.79 ha of native vegetation on certified land that does not require assessment under the BC Act.

NGH Environmental completed initial field investigations in February 2022 to map vegetation within the study area (NGH Environment 2022). Biosis undertook further field investigations from August 2022 to January 2023, which included vegetation and habitat mapping, vegetation plots, and targeted surveys for threatened entities listed under the BC Act and EPBC Act that may be impacted by the proposal.

The following Plant Community Types (PCTs) and associated Threatened Ecological Communities (TECs) were mapped within the study area:

- PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion:
    - *Cumberland Plain Woodland in the Sydney Basin Bioregion* (Critically Endangered Ecological Community [CEEC], BC Act).
    - *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (CEEC, EPBC Act).
- PCT 1395: *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion:*
    - Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC, BC Act).
    - Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC, EPBC Act).

In addition to the PCTs listed above, the following non-threatened PCTs were recorded:

- PCT 1181: Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion.
- PCT 877: Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion.

Following vegetation mapping, vegetation condition zones were applied. Biosis analysed the completed vegetation mapping, and vegetation integrity plots (BAM plots) were prepared. A total of 11 vegetation zones were mapped across the study area, and 20 BAM plots were completed. Further detail is provided in section 2.3.

A total of 32 threatened flora species and 42 threatened fauna species were subject to targeted surveys. These surveys determined that the following species or their habitats are assumed to be present within the study area:

- Threatened flora habitat for:
    - Thick Lip Spider Orchid *Caladenia tessellata* (Vulnerable, EPBC Act and Endangered, BC Act).
    - Sydney Plains Greenhood *Pterostylis saxicola* (Endangered, EPBC Act and BC Act).
    - Matted Bush-Pea *Pultenaea pedunculata* (Endangered, BC Act).
    - *Hibbertia puberula* (Endangered, BC Act).
    - Austral Pillwort *Pilularia novae-hollandiae* (Endangered, BC Act).
- Threatened fauna habitat for:
    - Little Lorikeet *Glossopsitta pusilla* (Vulnerable, BC Act).
    - Little Bent-winged Bat *Miniopterus australis* (Vulnerable, BC Act).
    - Large Bent-winged Bat *Miniopterus orianae oceanensis* (Vulnerable, BC Act).
    - Eastern False Pipistrelle *Falsistrellus tasmaniensis* (Vulnerable, BC Act).
    - Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (Vulnerable, BC Act).
    - Southern Myotis *Myotis macropus* (Vulnerable, BC Act).
    - Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (Vulnerable, BC Act).
    - Greater Broad-nosed Bat *Scoteanax rueppellii* (Vulnerable, BC Act).
    - Grey-headed Flying-Fox *Pteropus poliocephalus* (Vulnerable, EPBC Act and BC Act).
    - Large-eared Pied Bat *Chalinolobus dwyeri* (Vulnerable, EPBC Act and BC Act).
    - Masked Owl *Tyto novaehollandiae* (Vulnerable, BC Act).
    - Koala *Phascolarctos cinereus* (Endangered, EPBC Act and BC Act).

Following efforts to avoid and minimise impacts on biodiversity, the proposal would result in the following residual impacts to native vegetation as well as NSW listed biodiversity values:

- Clearing of 70.16 ha of Urban Native/Exotic vegetation and Non-Offsetable Grassland.
- Removal of 13 hollow bearing trees.
- Clearing of up to 13.10 ha of the following native vegetation (note* the same patch of vegetation may represent one or both of a BC Act and an EPBC Act TEC, each with different total areas impacted):
    - 5.77 ha (of which 3.64 ha occurs on non-certified land) of PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC (Cumberland Plain Woodland) under the BC Act.
    - 4.01 ha of PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC (Cumberland Plain Woodland) under the EPBC Act.
    - 7.33 ha (of which 5.67 ha occurs on non-certified land) of PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC under the BC Act.
    - 6.59 ha of PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC under the EPBC Act.
- Impacts on habitat for the following threatened flora and fauna:
    - Threatened flora:
        - Thick Lip Spider Orchid *Caladenia tessellata* (up to 0.53 ha).
        - Sydney Plains Greenhood *Pterostylis saxicola* (up to 0.53 ha).
        - Matted Bush-Pea *Pultenaea pedunculata* (up to 0.52 ha).

- *Hibbertia puberula* (up to 0.52 ha).
- Austral Pillwort *Pilularia novae-hollandiae* (up to 0.52 ha).

- Threatened fauna:
  - Little Lorikeet *Glossopsitta pusilla* (up to 8.40ha).
  - Large-eared Pied Bat *Chalinolobus dwyeri* (up to 8.27 ha).
  - Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (up to 8.40 ha).
  - Eastern False Pipistrelle *Falsistrellus tasmaniensis* (up to 8.40 ha).
  - Southern Myotis *Myotis macropus* (up to 7.84 ha).
  - Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (up to 8.40 ha).
  - Greater Broad-nosed Bat *Scoteanax rueppellii* (up to 8.40 ha).
  - Koala *Phascolarctos cinereus* (up to 7.52 ha).

Commonwealth Significant Impact Criteria (SIC) assessments and NSW Tests of Significance (ToS) were undertaken for threatened species and ecological communities either recorded or considered as having a moderate or higher likelihood of occurring. These assessments concluded that the proposal is unlikely to have a significant impact on any NSW or nationally listed species, populations or ecological communities. This conclusion was reached on the basis that impacts primarily occur in a linear nature, predominantly affecting the roadside edges of larger patches. Hence, while impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. Through the application of specific and measurable mitigation measures proven effective on similar proposals, it is anticipated that the level of impact to threatened entities would continue to be reduced from the levels assessed in this BAR. Transport is not required to prepare a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) for the proposal.

In accordance with Transport's *No Net Loss Guidelines* (Transport for NSW 2022a), the proposal would trigger the consideration of non-statutory offsets or conservation measures to offset impacts to the PCT/TEC and BAM species credit species determined to be impacted by the proposal. Outside of the areas that would be otherwise offset via these PCTs and species credit species, the *Tree and Hollow Replacement Guidelines* apply. A tree and hollow replacement plan would be developed for the proposal. Where tree and hollow replacement cannot be accommodated locally or can only be partially accommodated, payment must be made to Transport's Conservation Fund prior to the commencement of the proposal in accordance with the *Tree and Hollow Replacement Guidelines*.

With the effective implementation of safeguards and mitigation measures identified in this BAR, risk of impacts to biodiversity values can be mitigated to an acceptable level.

1. Introduction

1.1 The proposal

Transport for NSW (Transport) proposes to upgrade Picton Road between the Nepean River and Almond Street in Wilton, NSW (the proposal). The proposal includes upgrading the section of Picton Road from about 1.3 kilometres east of the bridge over the Nepean River to about 200 metres east of Almond Street, including the M31 Hume Motorway interchange.

The proposal forms the western section of the broader Picton Road upgrade, which involves upgrading about 30 kilometres of Picton Road between the Nepean River and the M1 Princes Motorway.

The proposal is subject to assessment by a review of environmental factors (REF) under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). For the purposes of these works, Transport for NSW is the proponent and the determining authority under Division 5.1 of the EP&A Act.

1.1.1 Proposal location

The proposal is located in Wilton, in the Wollondilly local government area (LGA). The proposal site, shown in Figure 1-1 and Figure 1-2, comprises the area that would be required to construct and operate the proposal, including ancillary facilities and operational infrastructure.

As a result of previous modifications to the proposal site, biodiversity surveys were completed in areas outside of the study area. These areas, as well as corresponding soil landscapes, waterways (Strahler) and Interim Biogeographic Regionalisation for Australia (IBRA) regions are displayed in Figure 1-3 and Figure 1-4,

1.1.2 Key features of the proposal

Key features of the proposal include:

- Widening and upgrading Picton Road for a distance of about five kilometres between the Nepean River and Almond Street to provide:
    - A minimum of two 3.5 metre-wide traffic lanes in each direction with a central median, increasing to three traffic lanes in each direction approximately between Wilton Park Road and Aerodrome Drive intersection and the Pembroke Parade and Greenway Parade intersection.
    - Three-metre-wide shoulders on the left lane side in each direction.
- Upgrading the existing Picton Road and M31 Hume Motorway interchange into a diverging diamond layout, including:
    - Removing the existing Picton Road bridge and constructing two new bridges over the M31 Hume Motorway.
    - Upgrading and realigning on and off ramp connections with the M31 Hume Motorway to suit the new interchange layout and to allow free flow of traffic between Picton Road and the M31 Hume Motorway.
    - Providing a new four-metre-wide shared user path along southern bridge.
    - Removing the existing traffic signals on Picton Road and installing new traffic signals with more efficient phasing and more traffic capacity.
- New and upgraded shared paths on Picton Road, including underpasses under the southbound on ramp connections to the M31 Hume Motorway and an overpass of the northbound off ramp connection from the M31 Hume Motorway, located:
    - Adjacent to the westbound slow lane of the proposal from the western extent to around 420 metres west of Almond Street to connect with planned active transport infrastructure to be delivered as part of the South East Wilton development.
    - Adjacent to the eastbound slow lane between Aerodrome Drive and the western extent of the proposal and between Pembroke Parade Parade and Almond Street.
- Reconfiguring the existing Picton Road intersections with Wilton Park Road, Aerodrome Drive, Janderra Lane and Almond Street into left in, left out only (the timing of delivery of the reconfigured Almond Street intersection is

subject to confirmation of timeframes for delivery of other road works planned at the intersection as outlined in section 1.1.3 and chapter 3 of the REF).

- Integration with new traffic signals and widening roadworks constructed in 2023 at the intersection of Picton Road and Pembroke Parade and Greenway Parade.
- Adjusting the posted speed from the western extent of the proposal, through the interchange and to the east of Pembroke Parade to 60 kilometres per hour (km/h).
- Ancillary work and construction activities associated with the proposal would include:
    - property works including acquisition, adjustment to existing accesses and fencing, and at-property noise treatments.
    - civil earthworks and drainage works.
    - construction and adjustment of retaining walls, road pavement, and water quality devices.
    - tie-in work to adjoining sections of Picton Road, M31 Hume Motorway and other local roads.
    - installing and adjusting roadside furniture and delineation, such as safety barriers, kerb and gutter, fencing, lighting, signage, noise treatment and pavement markings.
    - installing new intelligent transport systems including, but not limited to, closed circuit television and variable message signs.
    - protecting, adjusting and relocating existing utilities and associated structures.
    - landscaping and rehabilitation of disturbed areas.
    - adjustment and provision of noise treatments, including at-property works and noise mounds, as required.
    - establishment of temporary ancillary facilities to support construction including compound sites, site offices, stockpile, access tracks, turning bays, median crossovers on the M31 Hume Motorway, and laydown areas.
    - site preparation works, including vegetation clearing and grubbing, site fencing, temporary drainage measures, traffic management and implementation of environmental management measures.

An overview of the proposal is provided in Figure 1-1 and Figure 1-2. Further information is provided in chapter 3 of the REF.

1.1.3 Assessment terminology

The study area, and proposal site is shown in Figure 1-2.

The terms proposal site, assessment area, study area and locality are used throughout this report. These are defined as follows:

- The proposal site represents the boundary of the proposed works. This is the area that would be directly affected by the proposed works, including the location of proposal infrastructure, the area that would be directly disturbed by the movement of construction plant and machinery, and the location of the storage areas, compounds sites, etc. The boundary of the proposal site was used to calculate impacts to biodiversity values.
- The study area represents the boundary for ecological field investigations for the assessment. For the current assessment, the study area is represented by a 100 metre buffer from the proposal site (Figure 1-3). The study area includes areas with the potential to experience indirect impacts as a result of activities within the proposal site. This buffer was not applied in areas where no indirect impacts are expected.
- The assessment area includes the study area (defined above) and land within a 500 metre buffer of the study area. This represents the area considered for prescribed and indirect impacts as required under the BAM.
- The locality refers to the land within a 10 kilometre radius of the study area.

1.1.4 Purpose of the report

This biodiversity assessment report (BAR) has been prepared by Biosis on behalf of Transport as part of the REF. The report has been prepared to assess the potential impacts of constructing and operating the proposal on ecological values. The report:

- Describes the existing environment with respect to ecological values.

- Assesses the impact of the proposal on ecological values.
- Recommends measures to mitigate and manage the impacts identified.

This BAR has been prepared in accordance with the *Biodiversity Assessment Method* (DPIE 2020a) (the BAM). The BAM is part of the Biodiversity Offsets Scheme (BOS). The BOS is a legislated framework that is required when assessing impacts on terrestrial biodiversity from development and clearing. The application of the BAM is not required for activities subject to assessment and approval in accordance with Division 5.1 of the EP&A Act; however, Transport has adopted guidelines under the BAM to ensure best practice survey methods are used. The BAM provides a consistent method to assess impacts on biodiversity values from a proposed development or activity. The survey and assessment effort required by the BAM is scaled according to the extent and risk of impacts on biodiversity from a proposal, the availability and quality of existing information, and the area of land being assessed.

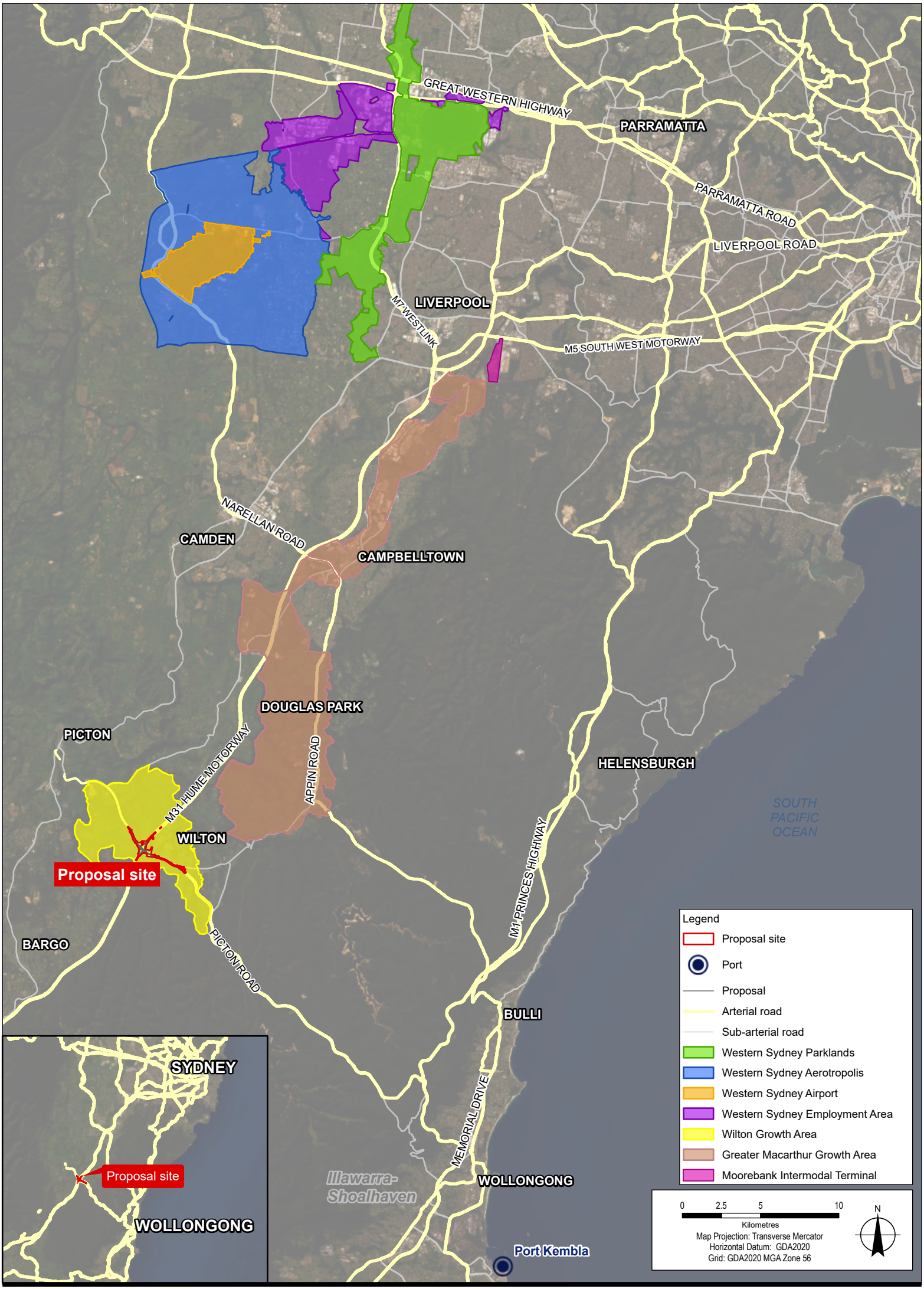

Figure 1-1 - Location of the proposal

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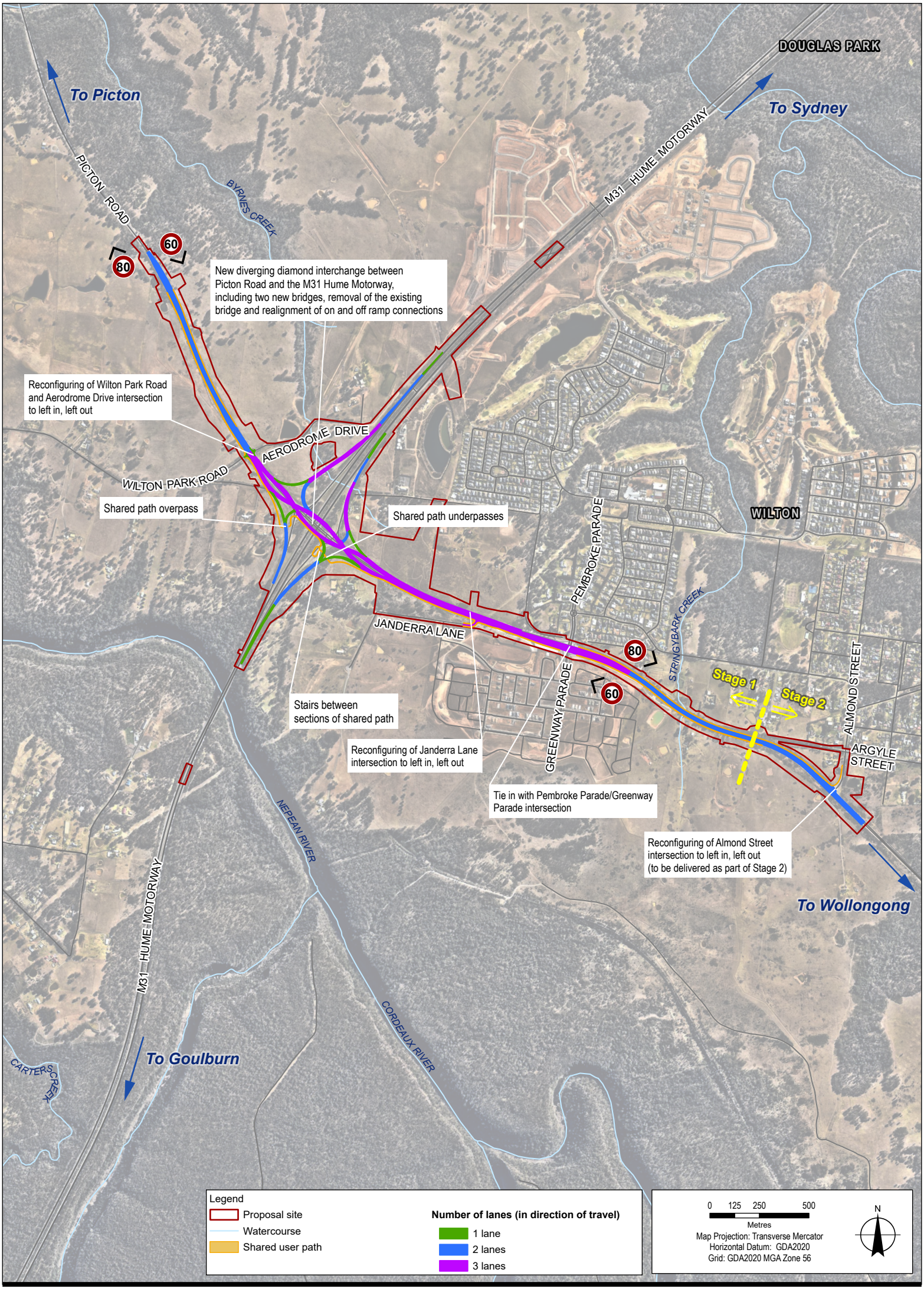

Figure 1-2 - The proposal

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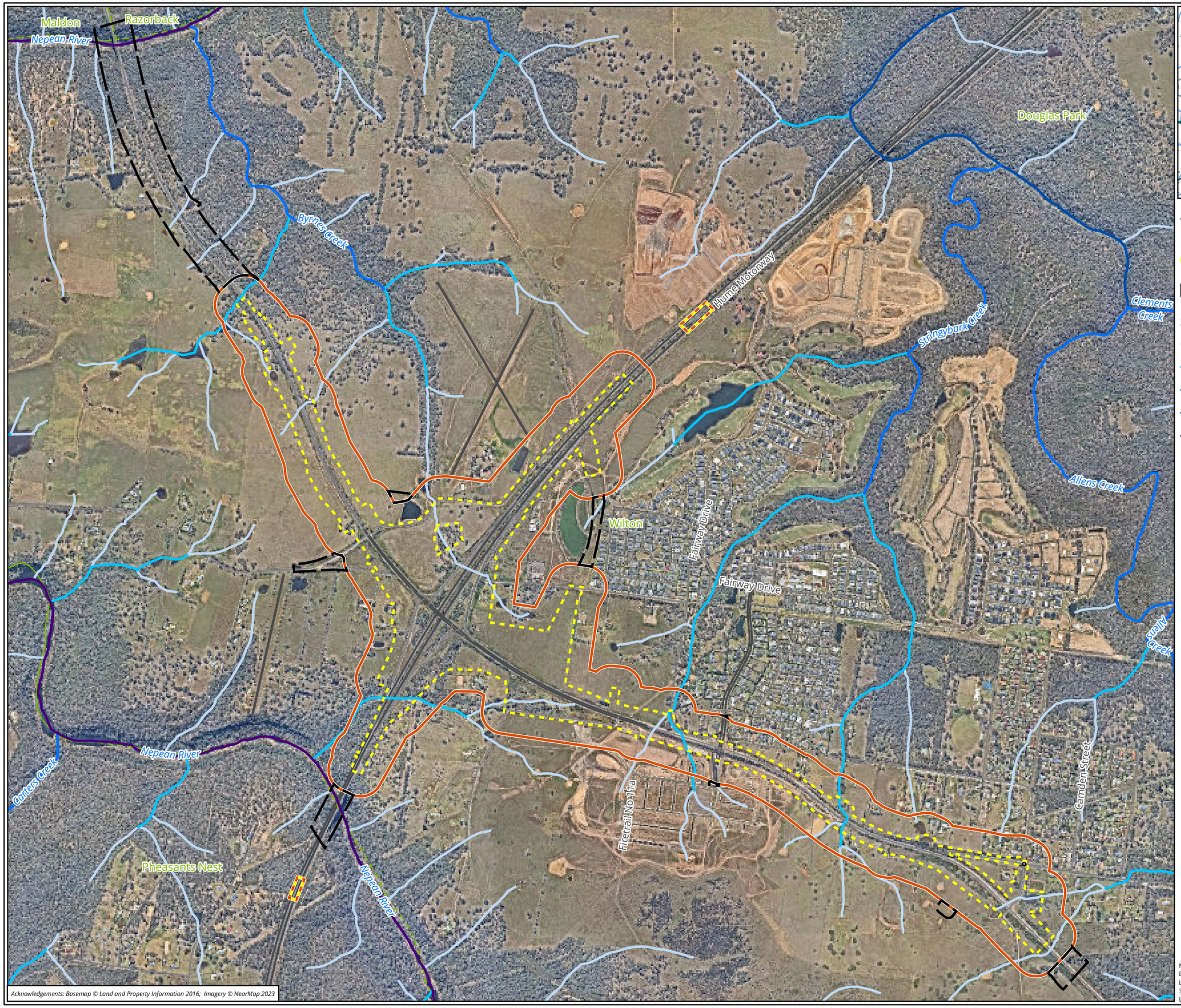

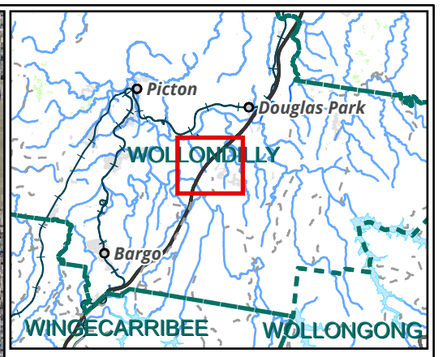

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Strahler order

- 1
- 2
- 3
- 4
- 7

Figure 1-3: Proposal context

0 500

Meters

Scale: 1:16,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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biosis

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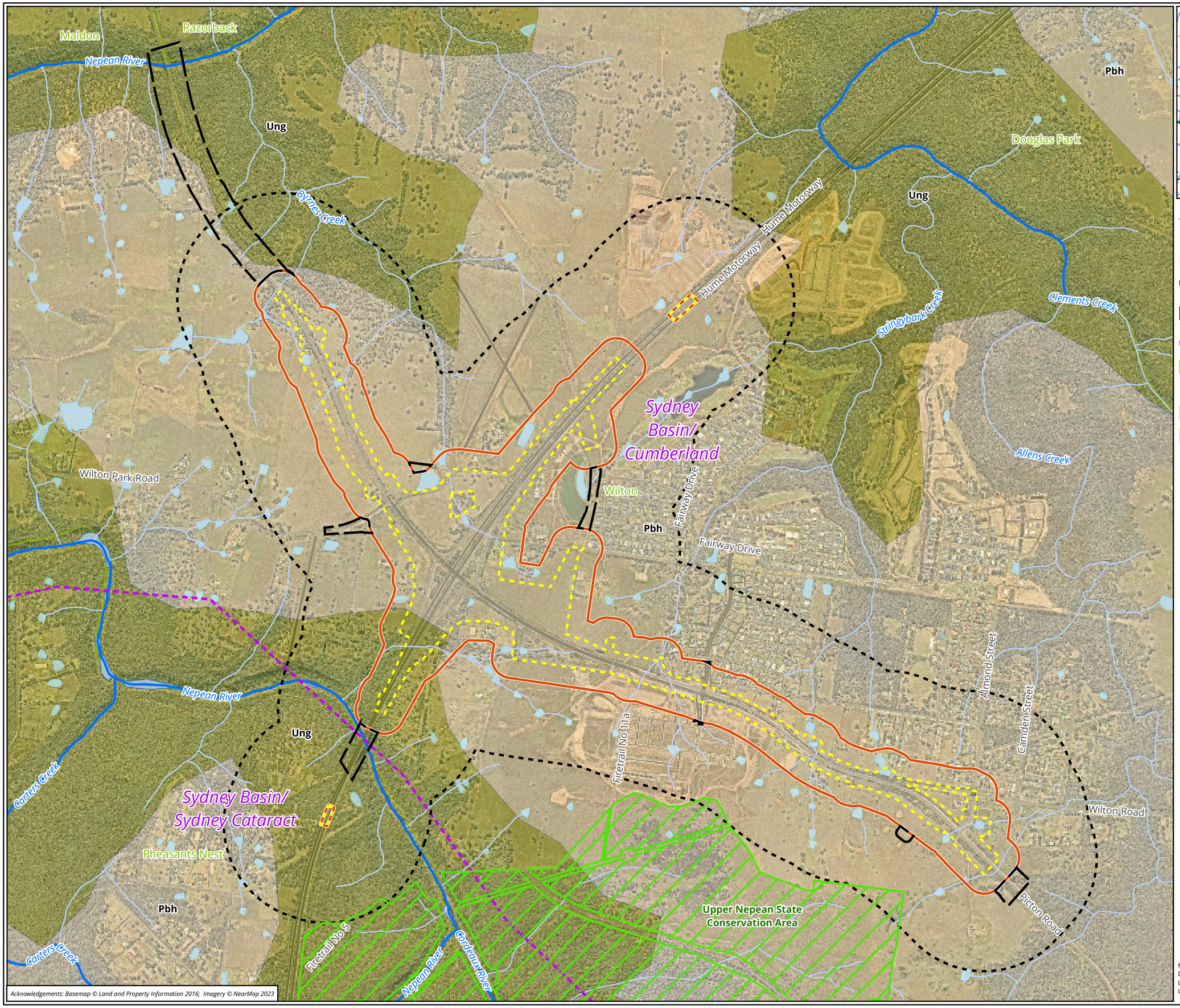
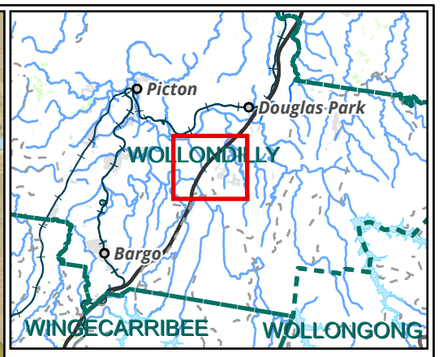
Acknowledgements: Basemap © Land and Property Information 2016; Imagery © NearMap 2023





Legend

- Study area
- Proposal site
- Assessment area
- Biodiversity survey area outside of study area
- IBRA Region/Sub-region
- NPWS Estate

Mitchell landscapes

- Pbh,Picton - Razorback Hills
- Ung,Upper Nepean Gorges

Figure 1-4: The proposal site

0 500

Meters

Scale: 1:18,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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1.2 Legislative context

A REF is prepared to satisfy Transport's duties under Section 5.5 of the EP&A Act to 'examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity' and Section 5.5 in making decisions on the likely significance of any environmental impacts. This biodiversity impact assessment forms part of the REF being prepared for the proposal and assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

The *Biodiversity Conservation Act 2016* (BC Act) requires that the significance of the impact on threatened species, populations and threatened ecological communities (TECs) is assessed using the test listed in Section 7.3 of the BC Act. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements, or a biodiversity development assessment report (BDAR) must be prepared by an accredited assessor in accordance with the BAM.

In September 2015, a 'strategic assessment' approval was granted by the Australian Minister for the Environment in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The approval applies to Transport's road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, populations, ecological communities and migratory species.

As a result, Transport's road proposals assessed via an REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species, including application of the 'avoid, minimise, mitigate and offset' hierarchy.
- Do not require referral to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for these matters, even if the activity is likely to have a significant impact.
- Must use the BAM to calculate credits that would offset significant impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species.

1.3 Biodiversity certification – Cumberland Plain Conservation Plan

On 17 August 2022, strategic biodiversity certification was conferred under Section 8.2 of the BC Act upon 11,165 hectares of land as 'Certified – Urban Capable Land' or 'Certified – Major Transport Corridor' under the *Order Conferring Strategic Biodiversity Certification - Cumberland Plain Conservation Plan* (NSW Government Gazette 2022). As a result, portions of the study area are designated as Certified – Urban Capable Land, Excluded Land and/or Avoided Land under *The Cumberland Plain Conservation Plan* (CPCP) (DPE 2022a) and the associated Biodiversity Certification Order (Figure 1-5).

The CPCP has identified land categories that would be certified for development under the BC Act, or where approval for development is to be sought under the EPBC Act. The various CPCP land categories include the following provisions and assessment requirements (DPE 2022a):

- Certified – Urban Capable Land: land identified for future urban development. This land is biodiversity certified under Part 8 of the BC Act, and as such, development under Part 5 of the EP&A Act does not require an assessment of likely impact of development on biodiversity to the extent that the development is carried out on biodiversity certified land (DPE 2022a). Therefore, development in these areas does not require further site by site biodiversity assessment or approval under the BC Act, if consistent with the CPCP and its approvals, which includes application of the CPCP's mitigation measures. Approval under Part 10 of the EPBC Act is yet to be issued by DCCEEW and therefore assessment under the EPBC Act is still required. In addition, approvals may still be required under other legislation, including the EP&A Act, *Fisheries Management Act 1994* (FM Act) and *Water Management Act 2000* (WM Act).
- Excluded Land: this category identifies land that has been excluded from the CPCP and for which NSW strategic biodiversity certification and approval through the Commonwealth strategic assessment process would not be sought. The proposal site largely resides within this land category, within the existing road corridor.
- Avoided Land: this category identifies land with high biodiversity values that are to be protected and therefore not certified for future urban development. Development on avoided land requires biodiversity assessment and must be assessed against the BC Act, and approval sought under the EPBC Act, if required.

1.3.1 Guidelines for Infrastructure Development

The *Cumberland Plain Conservation Plan Guidelines for Infrastructure Development* infrastructure guidelines (DPE 2022b) supports strategic conservation planning and the implementation of the CPCP. Development on land to which the CPCP applies must be consistent with the biodiversity approvals under the CPCP. The infrastructure guidelines form the key planning mechanisms designed to ensure development or an activity in the nominated areas is consistent with the biodiversity approvals under the CPCP.

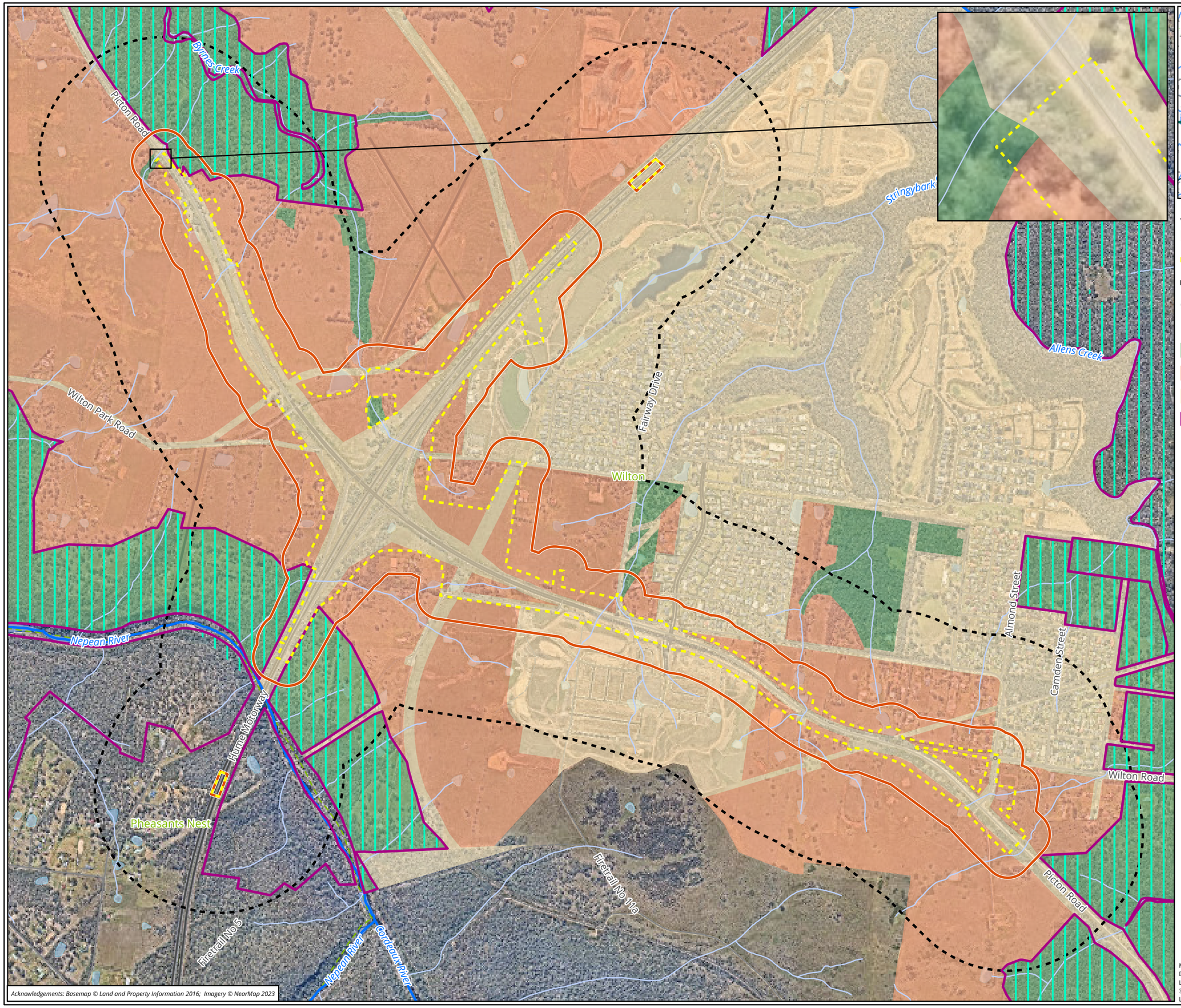
Section 1.6 of the infrastructure guidelines states that they apply to any infrastructure that is located on avoided land, certified-urban capable land or land in the strategic conservation area. Therefore, the infrastructure guidelines would apply to the proposal.

Part 2 of the infrastructure guidelines applies to 'essential infrastructure' that is proposed on avoided land. Essential infrastructure can include development or activities carried out under Part 5 of the EP&A Act. However, Part 2 of the infrastructure guidelines is not currently in effect as strategic assessment approval under Part 10 of the EPBC Act for 'essential infrastructure' has not yet been granted. As the Australian Government is yet to approve the CPCP under Part 10 of the EPBC Act, the assessment of impacts to EPBC Act listed Matters of National Environmental Significance within this BAR has included impacts to lands mapped within the CPCP boundary. However, it should be noted that while there is no concurrence from DCCEEW on the CPCP, a referral is not required as the proposal are proceeding under the 'strategic assessment' approval granted by the Australian Minister for the Environment in accordance with the EPBC Act. This approval applies to transports road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities, and migratory species. Part 3 of the infrastructure guidelines gives objectives and biodiversity matters to be addressed for Part 5 activities that are being carried out on avoided land, in the strategic conservation area or on certified-urban capable land. It is divided into three sections:

- Section 3.1 relates to activities on avoided land.
- Section 3.2 relates to activities in the strategic conservation area.
- Section 3.3 relates to activities on certified-urban capable land.

Part 3 of the infrastructure guidelines is relevant to this BAR, and further assessment has been made in section 3.11.3.

Further to this, the EP&A Regulation Section 201A requires notification to be provided to the Planning Secretary for activities impacting avoided land. This notification must conclude whether the proposal is consistent with the CPCP. The notification must be given within 30 days of determination. The proposal site currently includes a small area of avoided land (up to around 144 m^2). If impacts cannot be avoided through further refinement of the proposal site, a notification under Section 201A would be required.



Legend

- Study area
- Proposal site
- Assessment area

Cumberland Plain Conservation Plan

Land Category

- Avoided land
- Certified - urban capable land
- Excluded land
- Strategic conservation area
- Protected Koala habitat

Figure 1-5: Cumberland Plain Conservation Plan

0 500

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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2. Methods

2.1 Personnel

This BAR has been certified by Rebecca Dwyer (Accredited Assessor No. BAAS17067) and was carried out by appropriate qualified and experienced environmental professionals, ecologists and accredited people as demonstrated in Table 2-1.

Table 2-1: Personnel

Name	BAM Assessor Accreditation no. (if relevant)	Position / Role	Relevant qualifications
Rebecca Dwyer	BAAS17067	Principal Ecologist and NSW Ecology Team Leader Accredited Assessor	BLandscMgt&Cons (Hons) Over 15 years' on-ground experience in ecology. Experienced in undertaking ecological survey within the Sydney Basin Bioregion.
Paul Price	BAAS18089	Senior Ecologist Technical Lead – Botany Accredited Assessor	BASci, Botany DipCALM Over 20 years' experience in horticulture and conservation industries. Experienced in undertaking ecological survey within the Sydney Basin Bioregion.
Sarah Allison	-	Senior Zoologist	BSc (Hons 1) Over 6 years' experience undertaking impact assessment, project management and threatened fauna surveys across new South Wales and the Sydney Basin Bioregion with over 8 years' experience conducting targeted fauna survey throughout NSW, South Australia and the Northern Territory.
Felicity Williams	-	Senior Zoologist	BSc (Hons) GradDipEd (Secondary) Over 8 years' experience in applied ecology and consulting with specialist skills in microbat acoustic data collection and analysis. Experience in applying the BAM.
Joel Nicholson	-	Zoologist	BEnvSc (Hons 1). Over 3 years' experience undertaking fauna survey in the Sydney Basin Bioregion. Experience in applying the BAM.
Stephanie Cerato	-	Botanist	BConsBio (Hons) (Dean'sSchol) Over 5 years' experience undertaking ecological survey in the Sydney Basin Bioregion. Experience in applying the BAM.
Jake Schwebel	-	Botanist	BSc (Zoology/Conservation Biology) Over 2 years' experience undertaking ecological survey in the Sydney Basin Bioregion, combined with a strong background in bush regeneration and vegetation management. Experience in applying the BAM.
Rosie Gray	-	Graduate Botanist	BSc (Hons 1) Over 1 year experience in ecological consulting. Experience in applying the BAM.
Todd Horton	-	Graduate Botanist	BSc (Environmental Science) Over 1 year experience in ecological consulting.
Kaisha Edwards	-	Graduate Botanist	BSc (Hons1) Over 1 year experience in ecological consulting.

Name	BAM Assessor Accreditation no. (if relevant)	Position / Role	Relevant qualifications
Lauren Harley	-	Team Leader – GIS (NSW) and Senior GIS Consultant	Gcert EnvMgt BA IntSt, BSc EnvBio Over 9 years' experience in the use and application of GIS.
Claire Nelson	-	Graduate Zoologist	MPhil Behavioural Ecology and Evolution BSc Ecology and Evolutionary Biology Cert 3 in Wildlife and Exhibited Animal Care.

2.2 Background research

Sources of information used in the assessment included relevant databases, spatial data, literature and previous site reports All database searches were completed in April 2022. In order to provide a context for the assessment area, records of flora and fauna from within 10 kilometres (the locality) were collated from the following databases and datasets were reviewed:

- DCCEEW Protected Matters Search Tool (PMST) for matters protected by the EPBC Act (DCCEEW 2023).
- BioNet - the website for the Atlas of NSW Wildlife and Threatened Biodiversity Data Collection (TBDC) (DPE 2023a)
- BioNet Vegetation Classification database (DPE 2023b).
- Native vegetation regulatory map (DPE 2022c).
- BAM Important Areas maps (DPE 2022d).
- NSW DPI Fisheries Spatial Data Portal.
- PlantNET (The Royal Botanic Gardens and Domain Trust) (RBGDT 2022).
- BirdLife Australia, the New Atlas of Australian Birds 1998-2015.
- SEED Layer Intersection Tool.
- Regional vegetation mapping, including the Native vegetation of the Sydney Metropolitan area (DPE 2016).
- Commonwealth Atlas of Groundwater Dependent Ecosystems (GDE): GDE Atlas Map: Water Information: Bureau of Meteorology (bom.gov.au) (BOM 2023).
- National Flying-fox monitoring viewer (environment.gov.au).
- Core Koala Habitat identified by the Biodiversity and Conservation SEPP 2022.
- Cumberland Plain Conservation Plan (DPE 2022a).

The following data was also reviewed and relied on to provide additional information:

- Picton Road Biodiversity Surveys undertaken by NGH in 2022.
- Due Diligence report, 30 Berwick Park Road, (Lot 16 // DP 251051), Wilton, NSW (Ecoplanning 2022)

2.3 Vegetation assessment

2.3.1 Vegetation mapping

The extent of native vegetation within the study area was determined using the results of site investigations and Section 4 of the BAM (DPIE 2020a). Areas of native vegetation within the study area were identified based on the definition of native vegetation provided under Part 5A 60B of the NSW *Local Land Services Act 2013* (LLS Act). Native vegetation therefore includes any of the following types of plants native to NSW as defined under the LLS Act:

> *(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*
>
> *A plant is native to New South Wales if it was established in New South Wales before European settlement.*
>
> *Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water).*

In this BAR, native vegetation has been mapped and classified in accordance with the Plant Community Type (PCT) classification system, which is described in the BioNet Vegetation Classification Database. Areas of non-native vegetation have also been mapped and are described as containing vegetation that could not confidently be assigned a PCT due to higher disturbance levels, as they comprise exotic species, or non-indigenous species that would not naturally occur in the assemblage recorded.

NGH Environmental completed initial field investigations in February 2022 to map vegetation of the study area. Following this, Biosis undertook further field investigations from August 2022 to February 2023 to confirm vegetation previously mapped. Biosis assessments were undertaken in accordance with the BAM, which was overseen by Accredited Assessor Rebecca Dwyer (Accreditation number BAAS 17067). Vegetation mapping involved recording of dominant species, particularly canopy species, and then assigning PCTs to like sections of vegetation (Appendix A: Species recorded). Mapping the extent of native vegetation involved detailed field mapping and collection of GPS point locations using hand-held (uncorrected) tablet units (Samsung Galaxy Tab X) running the ArcGIS Field Maps application, using the inbuilt GPS, and aerial photo interpretation. Spatial locations are therefore considered to have an accuracy of generally ± five metres.

East coast revised PCTs

Revised draft PCTs for Eastern NSW were publicly released in June 2022 and finalised in early 2023 by the Department of Planning and Environment (DPE). The Biodiversity Assessment Method Calculator (BAM-C) was updated on 14 April 2023 to include these revised PCTs. The update included transitional arrangements for BAM-C cases that were in-progress prior to the update. The transitional arrangement allows BAM-C assessments to maintain access to the previous version of the BAM-C data and avoid changes to assessments. As the BAM-C for this assessment was created prior to the update, the older 'legacy' PCTs remain current, and are the format referred to in this BAR.

2.3.2 Vegetation survey and classification

The study area was surveyed in accordance with the BAM (DPIE 2020a), which involved:

- The identification and mapping of PCTs according to the structural definitions held in the BioNet Vegetation Classification database (DPE 2022e), with reference to information provided in reference mapping for the study area (DPE 2010, DPE 2018).
- Undertaking floristic plots within each vegetation zone in accordance with Section 4 of the BAM, considering varying condition states and avoidance of ecotones, areas of disturbance, and edges.
- The identification of native and exotic plant species, according to the *Flora of NSW* (Harden 1992, 1993, 2000, 2002) with reference to recent taxonomic changes.
- Targeted searches for plant species of conservation significance according to Surveying threatened plants and their habitats (DPIE 2020b).
- Incidental observations using the 'random meander' method (Cropper 1993).
- Identification of previous and current factors threatening the ecological function and survival of native vegetation within and adjacent to the development site.
- An assessment of the natural resilience of the vegetation of the site.

Vegetation zones

The process of vegetation identification commenced with a review of regional vegetation mapping datasets, prior to the field investigations to identify patches of native vegetation and potential PCTs as a starting point for the field investigations. These areas were validated and refined during field investigations. Broad condition states (and therefore vegetation zones) were assigned in the field, based on the presence of *relatively homogeneous areas of native vegetation that were the same PCT and in the same broad condition state* (DPIE 2020a). In accordance with Section 4.3.1 of the BAM, condition classes were assigned from recorded observations of tree, shrub and ground cover, grazing pressure and weed extent. The factors used to assign a condition class to each PCT are described in Table 2-2. The condition class assigned to vegetation influences the amount of biodiversity credits that are required to be offset when quantifying impacts to vegetation. This is due to the fact that lower condition vegetation is considered to have less species abundance/diversity and therefore generally contains lower quality habitat for threatened species.

Table 2-2: Criteria used to assign vegetation condition class

Condition class	Criteria
Non-native exotic grassland / Non-offsettable Grassland (NOG)	Ground layer dominated by exotics, no native overstorey present. If trees are present in the overstorey they are non-native or outside of known species range.
Exotic/urban native vegetation	Clearly modified vegetation that is subject to regular maintenance, such as slashing. Vegetation species composition not composed of locally occurring species.
Native vegetation – low condition	Low canopy cover, young age class of trees (regrowth), moderate shrub and ground layer diversity. No old growth canopy trees. Grazing pressure moderate to high. Moderate to high presence of exotic species.
Native vegetation – moderate condition	Generally intact canopy cover, advanced tree age class, moderate to high shrub and ground layer diversity. Limited old growth canopy trees with hollows. Grazing pressure low. Low cover of exotic species.
Native vegetation – high condition	High structural and floristic diversity. Old growth canopy trees with hollows present. Grazing pressure very low to absent.

Following the field investigation, botanists confirmed these mapped PCTs and condition classes and also identified the remaining PCTs that could not be assigned during the field investigation. This involved a process whereby the NSW PCT descriptions detailed in the NSW BioNet Vegetation Classification database (DPE 2022e) (including floristic assemblages, landscape position, soils and other determining variables) were compared to the collected floristic plot data and vegetation boundaries mapped in the field in order to confirm the final PCT status.

Plot-based vegetation survey

Vegetation integrity, or condition, was assessed using data obtained from undertaking BAM plots within the vegetation zones, as per Section 4.3.4 of the BAM (DPIE 2020a). Plot data was collected via:

- A 20 metre by 50 metre quadrat and 50 metre transect for assessment of site attributes and function.
- A 20 metre by 20 metre quadrat, nested within the larger quadrat for full floristic survey to determine composition and structure of the PCT.

The location of some of the completed BAM plots are outside of the current proposal site due to refinements to this boundary that occurred over time. These BAM plots are included in the current assessment as they are still representative of the vegetation zones present and provide context for the surrounding environment.

Table 2-3 and Table 2-4 summarise the number of plots required as per the BAM and the number of plots from the completed. The location and name of plots completed is displayed on Figure 2-1.

Table 2-3: Minimum number of plots required per zone area

Vegetation zone area (ha)	Minimum number of plots/midlines
<2	1 plot/midlines
>2-5	2 plots/midlines
>5-20	3 plots/midlines
>20-50	4 plots/midlines
> 50–100	5 plots/midlines
> 100–250	6 plots/midlines
> 250–1000	7 plots/midlines; more plots may be needed if the condition of the vegetation is variable across the zone.
> 1000	8 plots/midlines; more plots may be needed if the condition of the vegetation is variable across the zone.

Table 2-4: Minimum number of plots required and completed per vegetation zone

PCT	Veg. zone	Area (ha) in proposal site	Minimum number of plots required	Number of plots completed by NGH	Number of plots completed by Biosis	Total number of plots completed
PCT 849	Zone 1_Moderate	4.01	2	3	1	4
	Zone 2_Scattered Trees	0.03	1	0	1	1
	Zone 3_DNS	1.20	1	0	1	1
	Zone 4_DNG	0.53	1	1	0	1
PCT 1181	Zone 5_High	0 (present in study area only)	0	1	0	1
PCT 1395	Zone 6_High	0.05	1	2	1	3
	Zone 7_Moderate	1.40	2	3	0	3
	Zone 8_Low	5.14	3	3	0	3
	Zone 9_Scattered Trees	0.42	1	0	1	1
	Zone 10_DNS	0.32	1	0	1	1
PCT 877	Zone 11_High	0 (present in study area only)	0	0	0	0

PCT	Veg. zone	Area (ha) in proposal site	Minimum number of plots required	Number of plots completed by NGH	Number of plots completed by Biosis	Total number of plots completed
Urban Native/Exotic and NOG	N/A	70.16	5	4	2	6

2.3.3 Patch size

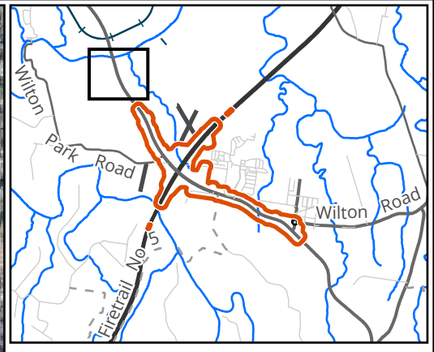
Patch size classes for each vegetation zone present within the proposal site were assessed as per Section 4.3.2 of the BAM using a select process in ArcGIS. All native vegetation with a gap of less than 100 metres from the next area of native vegetation (or ≤ 30 metres for non-woody ecosystems), is considered a single patch, with a patch able to extend onto adjoining land.

2.3.4 Native vegetation cover

Calculation of native vegetation cover for the purposes of the BAM-C acts as a filter for candidate species to be considered at a development site. Vegetation within the assessment area (i.e. within the 500 metre buffer area) was assessed using aerial photographic interpretation, field survey results and existing vegetation mapping (including NGH provided data). Results are displayed below in Table 2-5.

Table 2-5: Native vegetation cover in the assessment area

Assessment area 500m buffer (ha)	983.42
Total area of native vegetation cover within the 500m buffer (ha)	246.66
Total area of native vegetation (ha) within the study area	35.50
Total area of native vegetation (ha) within the proposal site	13.10
Percentage of native vegetation cover (%)	25.08
Class (0-10, >10-30, >30-70 or >70%)	>10-30%



Legend

- Biodiversity survey area outside of study area
- NGH BAM Plots
- Biosis BAM Plots

Vegetation zone (within previous proposal site)

- Zone 5_PCT1181_High
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 12_PCT1395_DNG
- Non-offsettable grassland

Figure 2-1: Vegetation plot-based survey locations
Page 1

0 50 100 150
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

N

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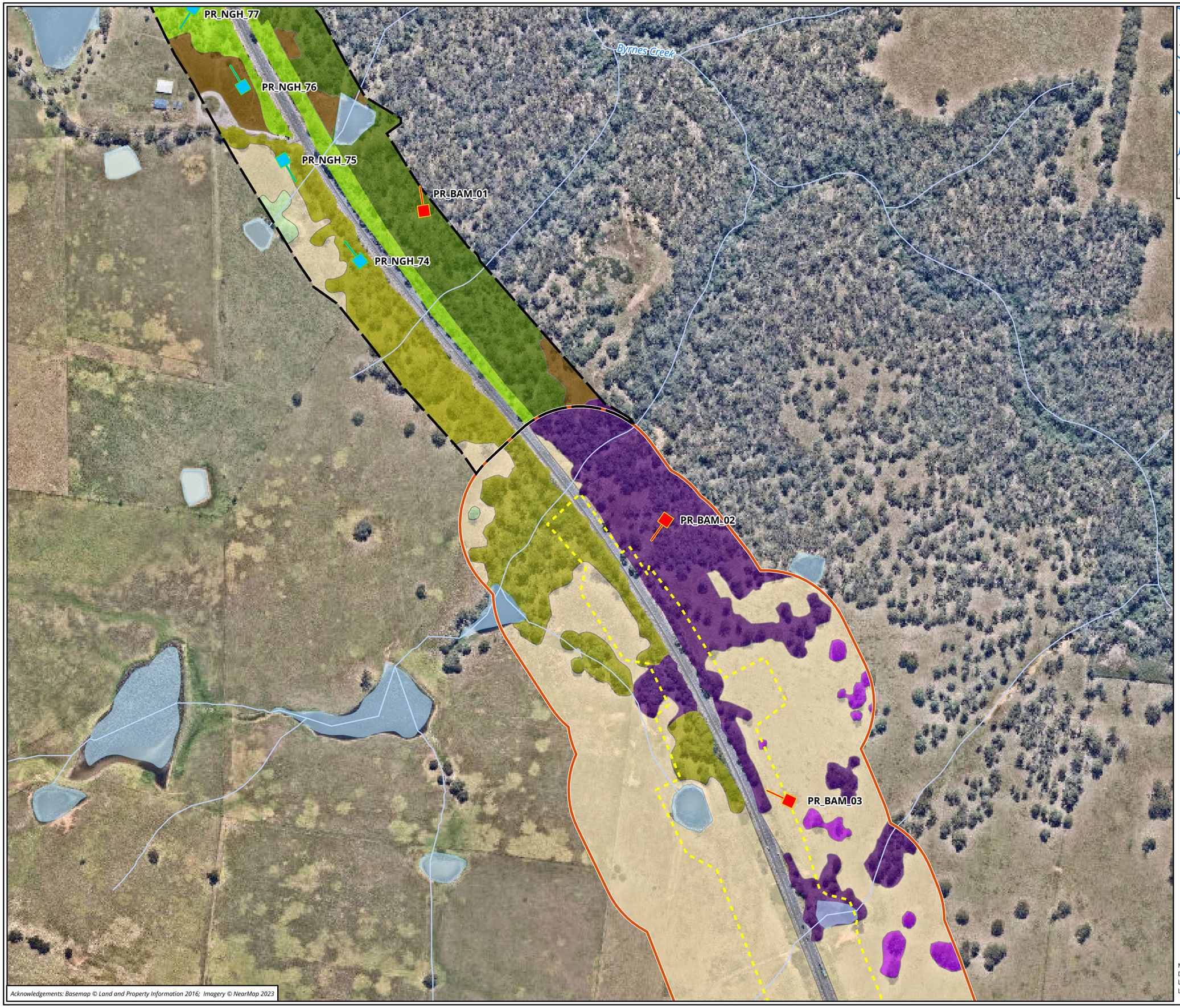

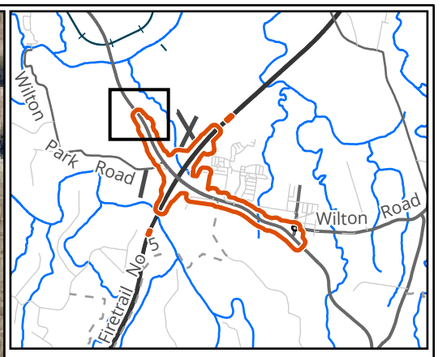

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- NGH BAM Plots
- Biosis BAM Plots

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Non-offsettable grassland

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 12_PCT1395_DNG
- Non-offsettable grassland

Figure 2-1: Vegetation plot-based survey locations Page 2

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Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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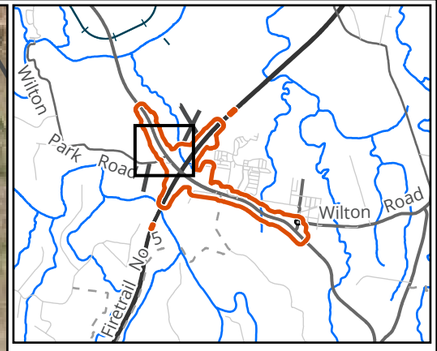

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- NGH BAM Plots
- Biosis BAM Plots

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 3_PCT849_DNS
- Zone 4_PCT849_DNG
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS
- Urban Native/Exotic
- Non-offsettable grassland

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low
- Non-offsettable grassland
- Urban Native/Exotic

Figure 2-1: Vegetation plot-based survey locations
Page 3

0 50 100 150

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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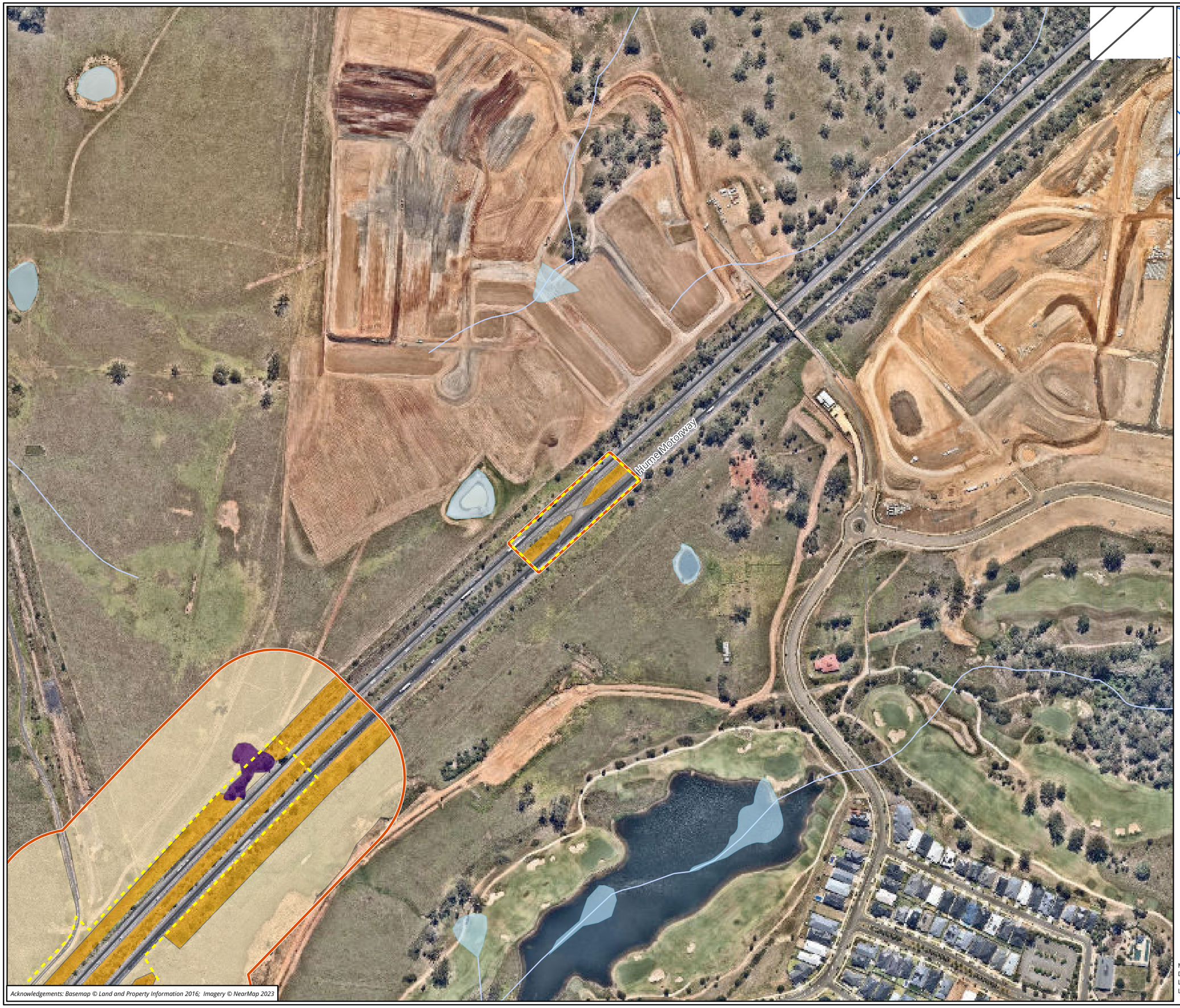

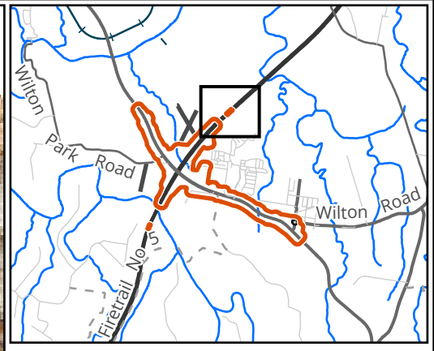

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Urban Native/Exotic
- Non-offsettable grassland

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Figure 2-1: Vegetation plot-based survey locations
Page 4

0 50 100 150

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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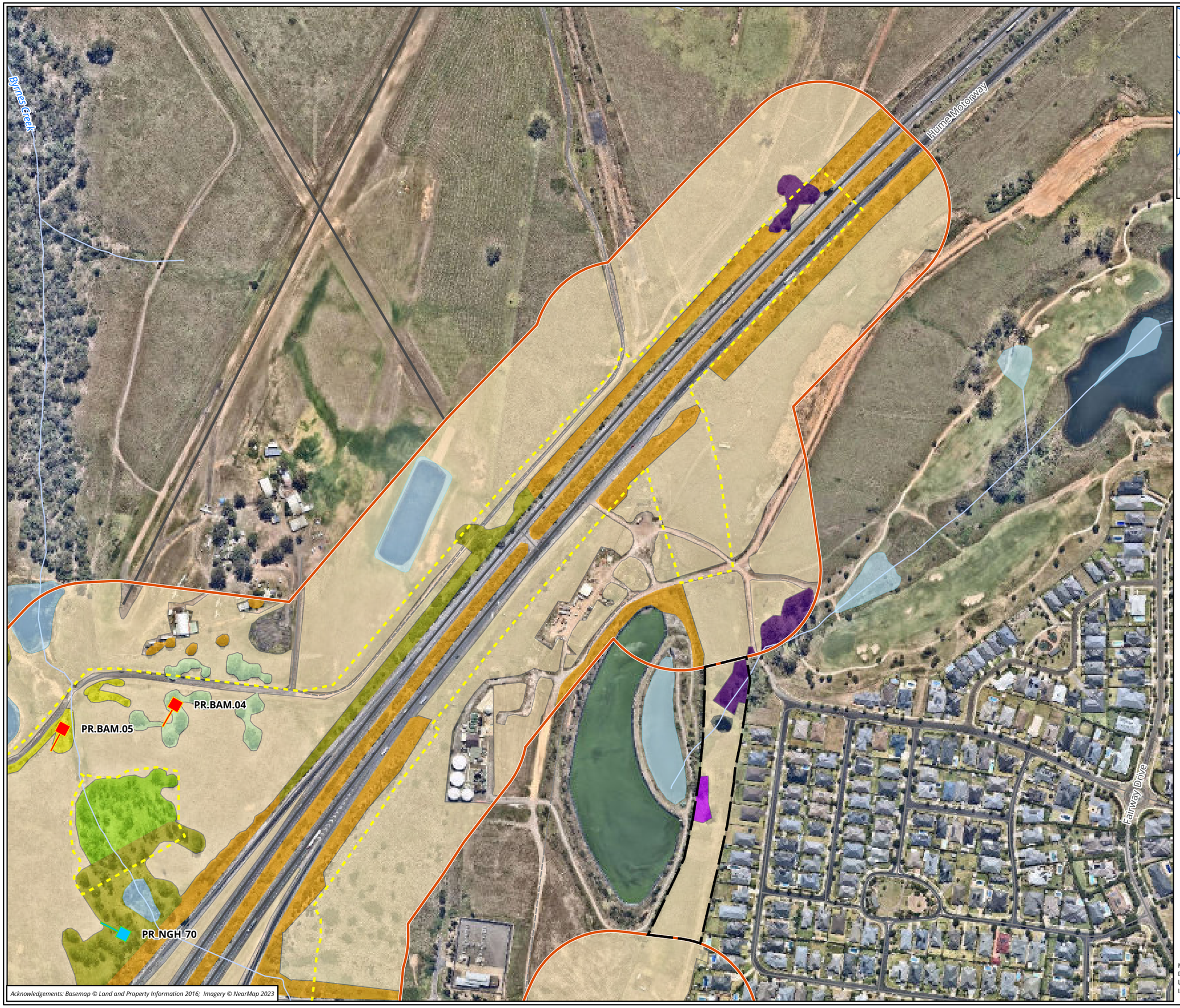

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- NGH BAM Plots
- Biosis BAM Plots

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS
- Urban Native/Exotic
- Non-offsettable grassland

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Non-offsettable grassland

Figure 2-1: Vegetation plot-based survey locations Page 5

0 50 100 150

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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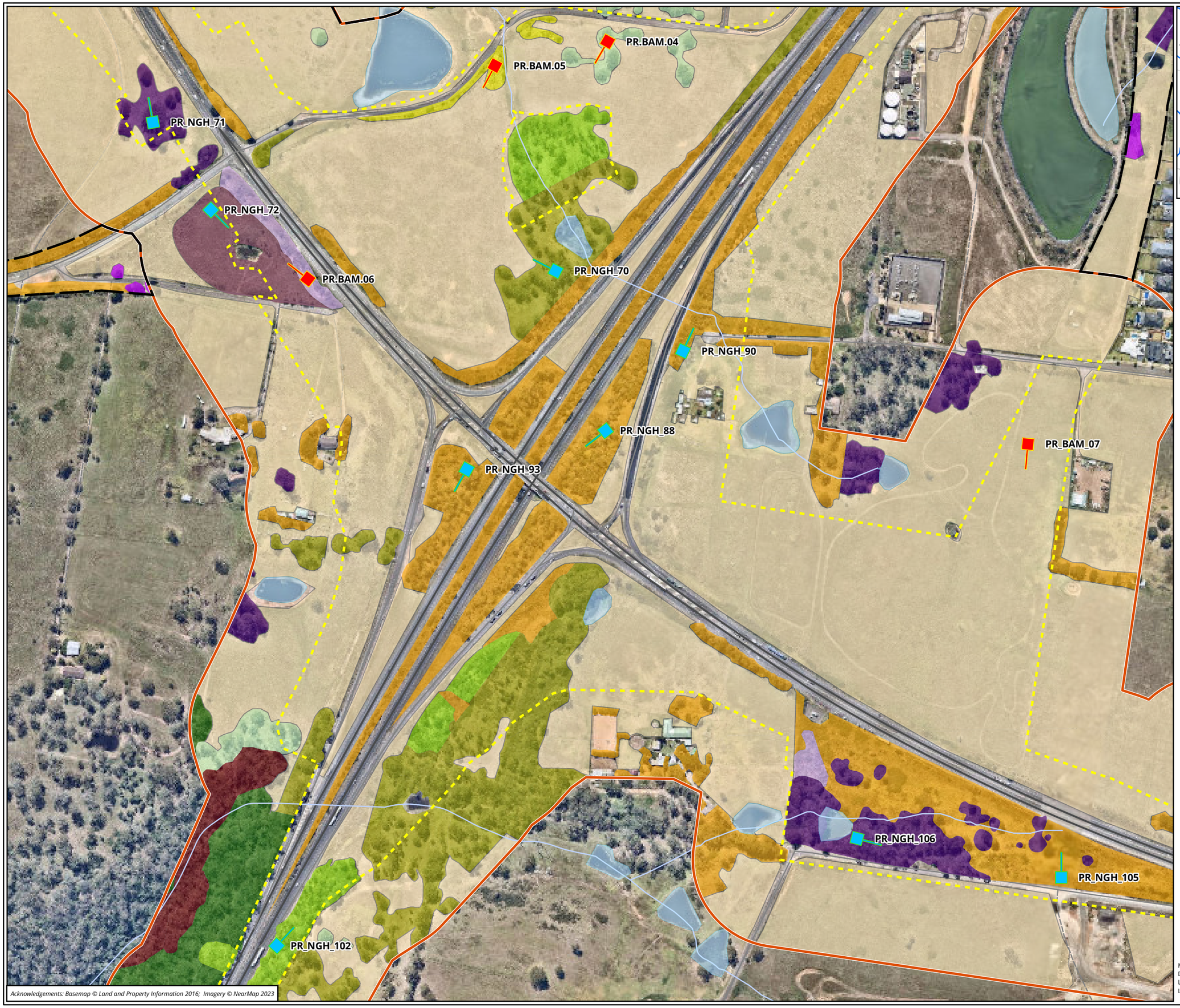

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- NGH BAM Plots
- Biosis BAM Plots

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 3_PCT849_DNS
- Zone 4_PCT849_DNG
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS
- Zone 11_PCT877_High
- Urban Native/Exotic
- Non-offsettable grassland

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Non-offsettable grassland
- Urban Native/Exotic

Figure 2-1: Vegetation plot-based survey locations
Page 6

0 50 100 150
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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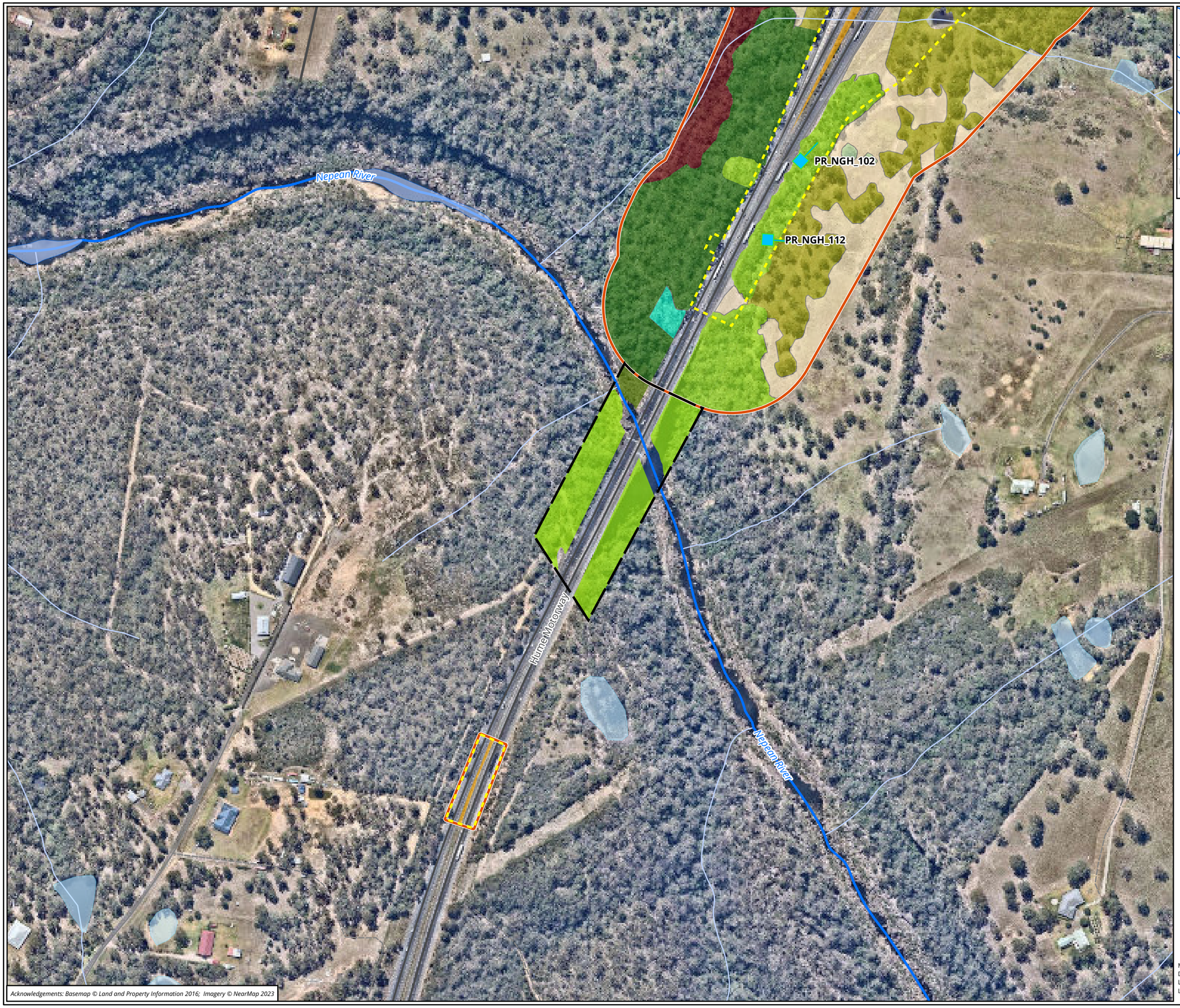

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Figure 2-1: Vegetation plot-based survey locations
Page 7

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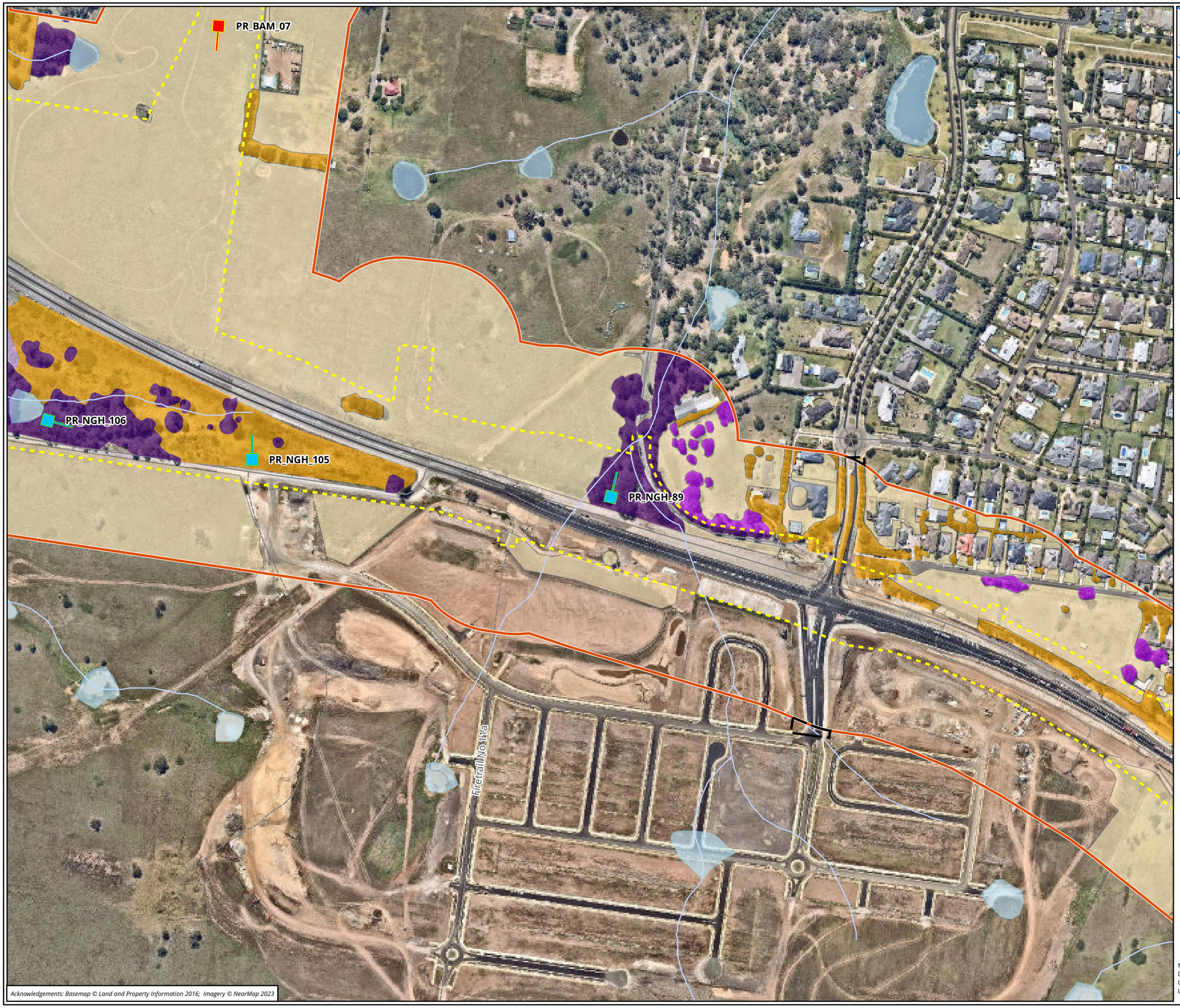

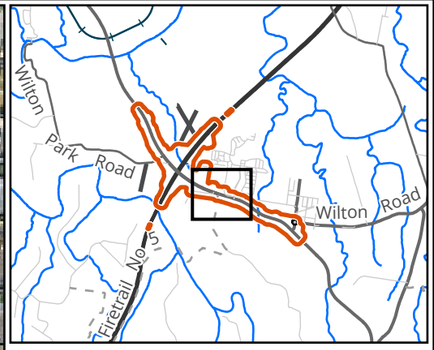

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- Study area
- Proposal site
- Biodiversity survey area outside of study area
- NGH BAM Plots
- Biosis BAM Plots

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 3_PCT849_DNS
- Urban Native/Exotic
- Non-offsettable grassland

Figure 2-1: Vegetation plot-based survey locations
Page 8

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Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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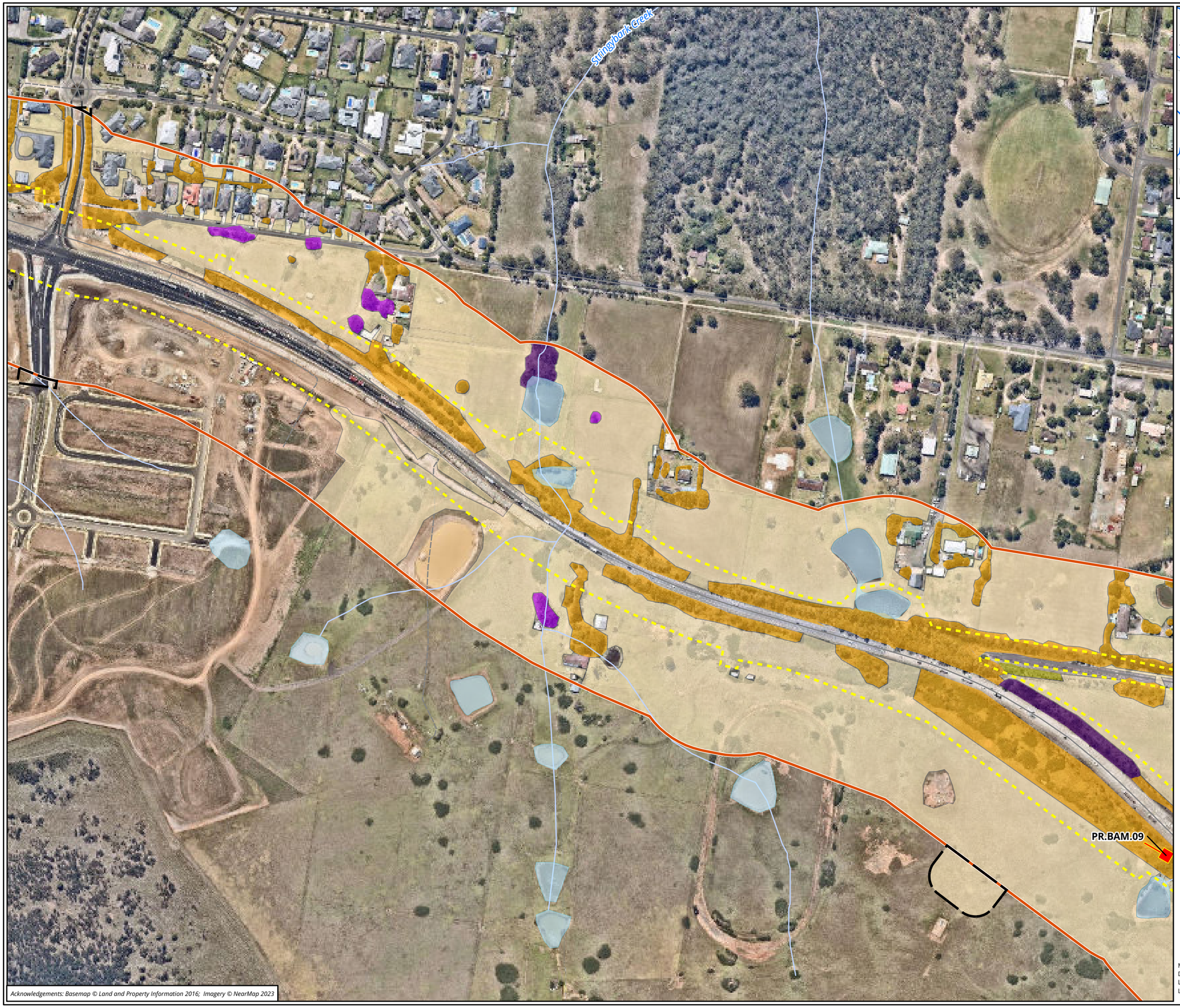

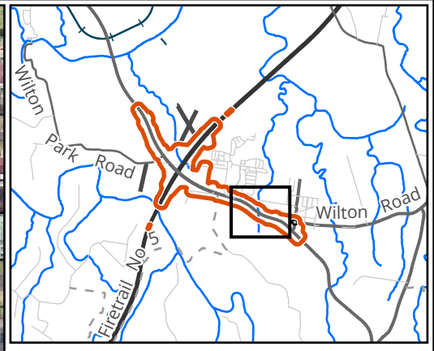

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- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Biosis BAM Plots

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low
- Urban Native/Exotic
- Non-offsettable grassland

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Figure 2-1: Vegetation plot-based survey locations
Page 9

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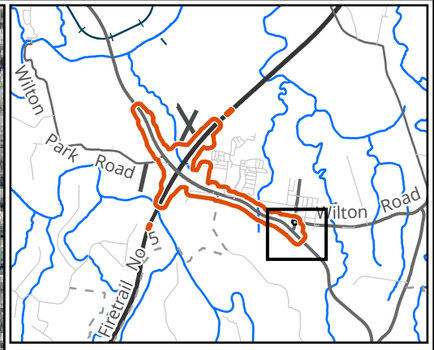

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Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Biosis BAM Plots

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 3_PCT849_DNS
- Zone 8_PCT1395_Low
- Urban Native/Exotic
- Non-offsettable grassland

Vegetation zone (within previous proposal site)

- Zone 6_PCT1395_High
- Zone 8_PCT1395_Low
- Non-offsettable grassland
- Urban Native/Exotic

Figure 2-1: Vegetation plot-based survey locations
Page 10

0 50 100 150

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

Matter: 36086, Date: 17 October 2023
Drawn by: JB, Checked by: JS, Last edited by: jbeckius
Location: P:\36000s\36086\Mapping\36086_Updates_20230809.aprx
Layout: 36086_F2-1_Plots

2.4 Threatened species assessment

2.4.1 Survey overview

Staged surveys of the proposal site were conducted in accordance with the BAM and with reference to appropriate threatened species survey guidelines for targeted species. Site surveys included:

- Initial site stratification and vegetation mapping.
- Sampling of vegetation integrity plots.
- Habitat assessments, including hollow-bearing tree assessments.
- Targeted surveys for threatened flora and fauna.

The biodiversity survey boundary, which included completing BAM plots, was significantly larger than the proposal site area. Findings from these surveys aided in the refinement of the proposal site to reduce impacts to threatened entities. Survey effort that has directly contributed to this BAR is summarised in Table 2-6.

Table 2-6: Survey details and timing

Stage	Date	Survey
Initial fieldwork and vegetation mapping	01/02/2022 – 30/03/2022 (NGH) 3/08/2022 – 16/08/2022 14/09/2022 – 08/12/2022	• Vegetation mapping • Mapping of habitat features, including hollow-bearing trees • Habitat assessment
Sampling of vegetation integrity plots	18/01/2023 – 1/03/2023	• BAM plots
Targeted flora surveys		
Autumn Surveys	01/02/2022 – 30/03/2022 (NGH)	• Transect surveys
Spring/Summer Surveys	14/09/2022 – 30/01/2023	• Transect surveys
Targeted fauna surveys		
Koala surveys	27/10/2022	• Koala Spot Assessment Technique (SAT) surveys
Owl surveys	3/08/2022 – 16/08/2022	• Spotlighting • Call playback
Diurnal bird surveys	Winter; 3/08/2022 – 16/08/2022 Spring; 12/08/2022 – 29/11/2022	• Transects • Habitat assessment
Frog surveys	21/11/2022 – 22/12/2022	• Call playback • Aural-visual survey • Habitat assessment
Mammal surveys	16/11/2022 – 22/12/2022	• Camera trapping • Spotlighting
Reptile surveys	8/08/2022 – 23/09/2022	• Habitat assessment • Opportunistic rock turning
Bat surveys	21/02/2022 – 16/03/2022 (NGH) 12/10/2022 – 22/12/2022	• Stag watches • Audio monitoring

Stage	Date	Survey
Snail surveys	01/02/2022 – 30/03/2022 (NGH) 27/10/2022	• Point surveys under habitat features

2.4.2 Habitat suitability for species that can be predicted by habitat surrogates (ecosystem credit species)

A list of predicted species (ecosystem credit species) expected to occur within the proposal site was generated as per Section 5 of the BAM (DPIE 2020a). Impacts to these species require assessment, however targeted survey is not required as these species are assumed to occur, based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape, and calculated patch sizes. These species are identified as ecosystem credit species in the guideline Threatened Biodiversity Data Collection (DPE 2022f) (TBDC).

A list of ecosystem credit species was generated for the IBRA subregions within which the proposal site occurs. These lists were generated through the two BAM-C cases which were set up to separately process the native vegetation impacts occurring within each subregion. Ecosystem credit species that matched all relevant criteria for inclusion as part of this assessment were automatically populated into these lists by the BAM-C. No ecosystem credit species were excluded from the assessment.

2.4.3 Habitat suitability for species that cannot be predicted by habitat surrogates (species credit species)

Species credit species are threatened species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. These candidate species are identified as species credit species in the TBDC (DPE 2022f). A targeted survey or an expert report is required to confirm the presence of these species within the proposal site, or alternatively the species can be assumed to be present (DPIE 2020a).

The potential for a species to occur within the proposal site was assessed in accordance with Section 5.2 of the BAM (DPIE 2020a) and species with geographical restrictions, or habitat constraints not present, were not required to be assessed.

A summary of the habitat suitability assessment undertaken for threatened species is included below.

2.4.4 Habitat suitability assessment

A habitat suitability assessment was undertaken and is included in Appendix B: Habitat suitability assessment Databases searches (BioNet and PMST) of the locality were combined with species credit species and ecosystem credit species generated by the BAM-C based on the PCTs recorded in the study area.

In addition to the knowledge and experience of involved personnel, information utilised in the habitat assessment includes ecological information contained within BioNet, the TBDC and Species Profile and Threats (SPRAT) database as appropriate. Where background information or detailed survey is lacking, the precautionary principle has been applied and a 'Moderate' likelihood of occurrence rating given to ensure that all threatened entities at risk of being impacted by the proposal have been adequately assessed.

For all species-credit species and EPBC Act listed species that were deemed to have a moderate or higher likelihood of occurrence during habitat suitability assessments, targeted surveys were completed. Details of the surveys undertaken are outlined further in sections 2.4.5 and 2.4.6.

2.4.5 Targeted flora surveys

A total of 54 threatened flora species were considered unlikely to occur in the study area based on geographic or habitat limitations. The remaining 32 threatened flora species returned by background searches (BioNet, PMST and BAM-C) were subject to targeted surveys, the methods and effort employed were in accordance with *Surveying threatened plants and their habitats, NSW survey guide for the Biodiversity Assessment Method* (DPIE 2020b). Parallel field traverses of five to 10 metre widths (determined by density of vegetation and life form of the target species) were undertaken in areas of suitable habitat by Biosis ecologists. During each survey the parallel traverses were walked by a minimum of two experienced botanists working systematically across all areas of potential habitat within the study area, following predetermined transect lines

(start/end point) loaded onto tablet computers. The threatened flora survey details are summarised in Table 2-7 and the completed survey effort is shown on Figure 2-3. It should be mentioned that due to logistical complications, the widths of survey transect lines were in some cases wider than five to 10 metres. Logistical complications included:

- Physical barriers: Physical barriers such as dense vegetation, steep slopes, rugged terrain, or water bodies made it difficult and/or unsafe to conduct surveys.
- Areas of large weed plumes (primarily Blackberry).

It should be noted that targeted surveys were unable to be completed within Lot 7 in DP 1280088 and Lots 16 and 18 in DP251051 within the study area, habitat suitability for threatened species within these lots have been further considered in Appendix B.

Table 2-7: Targeted threatened flora survey details

Species name	Common name	Required survey period	Minimum survey requirements[1]	Survey completed?	Present?
Acacia bynoeana	Bynoe's Wattle	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site from September-February, except within Lot 18 in DP251051.	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Acacia pubescens	Downy Wattle	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site from September-February, except within Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Caladenia tessellata	Thick Lip Spider Orchid	September - October	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed in October with the exception of Lot 7 in DP 1280088 and Lots 16 and 18 in DP251051	Yes – Assumed present in the following: • Lot 7 in DP 1280088 • Lot 16 in DP251051 • Lot 18 in DP251051
Callistemon linearifolious	Netted Bottle Brush	October - January	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in December, with the exception of Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Cynanchum elegans	White-flowered Wax Plant	All year	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed across the proposal site from September-February.	No – Targeted surveys did not detect the species
Darwinia peduncularis	-	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site, except Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment

Species name	Common name	Required survey period	Minimum survey requirements[1]	Survey completed?	Present?
Deyeuxia appressa	-	December	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed across the proposal site in December.	No – Targeted surveys did not detect the species
Dillwynia tenuifolia	-	August - October	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in September with the exception of Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Epacris purpurascens var. *purpurascens*	-	September - October	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in September, except within Lots 16 and 18 in DP251051	No – habitat assessment provided in Appendix B.
Eucalyptus camfieldii	Camfield's Stringybark	All year	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed across the proposal site from September-February.	No – Targeted surveys did not detect the species
Grevillea juniperina subsp. *juniperina*	Juniper-leaved Grevillea	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site from September-February, except within Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Grevillea parviflora subsp. *parviflora*	Small-flower Grevillea	August - November	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in September, except within Lots 16 and 18 in DP251051.	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Gyrostemon thesioides	-	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site from September-February, except within Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Haloragodendron lucasii	-	All year	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed across the proposal site from September-February.	No – Targeted surveys did not detect the species
Hibbertia puberula	-	October - December	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in October, except within Lots 16 and 18 in DP251051.	Yes – Assumed present in the following: • Lot 16 in DP251051 • Lot 18 in DP251051

Species name	Common name	Required survey period	Minimum survey requirements[1]	Survey completed?	Present?
Hibbertia superans	-	July - December	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in October, except within Lots 16 and 18 in DP251051.	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Leucopogon exolasius	Woronora Beard-heath	August - September	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed in September with the exception of Lot 7 in DP 1280088, and Lots 16 and Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Leucopogon fletcheri subsp. *fletcheri*	-	August - September	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed in September with the exception of Lot 7 in DP 1280088, and Lots 16 and Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Melaleuca deanei	Deane's Paperbark	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in September, except within Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Pilularia novae-hollandiae	Austral Pillwort	October-December	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in December, except within Lots 16 and 18 in DP251051.	Yes – Assumed present in the following: • Lot 16 in DP251051 • Lot 18 in DP251051
Persicaria elatior	Tall Knotweed	December - May	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in December, except within Lots 16 and 18 in DP251051.	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Persoonia bargoensis	Bargo Geebung	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in December, except within Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Persoonia hirsuta	Hairy Geebung	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in December, except within Lot 18 in DP251051.	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Persoonia mollis subsp. *maxima*	-	All year	5-10 m wide parallel field traverses in	Completed across the proposal site in December, except	No – habitat assessment provided in Appendix B:

Species name	Common name	Required survey period	Minimum survey requirements[1]	Survey completed?	Present?
			suitable habitat	within Lot 18 in DP251051	Habitat suitability assessment
Persoonia nutans	Nodding Geebung	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in December, except within Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Pimelea curviflora var. *curviflora*	-	October - March	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in November, except within Lots 16 and 18 in DP251051.	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Pimelea spicata	Spiked Rice-flower	All year	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in November, except within Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Pomaderris brunnea	Brown Pomaderris	August - October	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in October, except within Lot 7 in DP 1280088.	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Pterostylis saxicola	Sydney Plains Greenhood	October	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed in October with the exception of Lot 7 in DP 1280088 and Lots 16 and 18 in DP251051	Yes – Assumed present in the following: • Lot 7 in DP 1280088 • Lot 16 in DP251051 • Lot 18 in DP2*51051*
Pultenaea pedunculata	Matted Bush-pea	September - November	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site, except within Lots 16 and 18 in DP251051	Yes – Assumed present in the following: • Lot 16 in DP251051 • Lot 18 in DP251051
Rhizanthella slateri	Eastern Australian Underground Orchid	September - November	5-10 m wide parallel field traverses in suitable habitat	Minimum survey requirement completed in October with the exception of Lot 7 in DP 1280088 and Lots 16 and 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment
Tetratheca glandulosa	-	August - November	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in October, except within Lots 16 and 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment

Species name	Common name	Required survey period	Minimum survey requirements[1]	Survey completed?	Present?
Thesium australe	Austral Toadflax	November-February	5-10 m wide parallel field traverses in suitable habitat	Completed across the proposal site in December, except Lot 18 in DP251051	No – habitat assessment provided in Appendix B: Habitat suitability assessment

2.4.6 Targeted fauna surveys

Habitat assessment of the study area determined that suitable habitat and microhabitat features for threatened fauna species occurred within the proposal site and broader study area. The study area provides high quality, well connected habitat in the south and east, and scattered lower quality habitat is present through the remaining areas of the proposal site in areas historically subject to clearing and agricultural land uses. Microhabitat features present within the proposal site include ephemeral waterways, farm dams and hollow-bearing trees. The broader study area also supports sandstone outcrops associated with the Nepean River Gorge which may provide suitable overhangs, crevices and caves for roosting by threatened microbat species.

The features of the study area provide potential habitat for a number of threatened species and as such these species require targeted survey. Survey groupings included diurnal birds, nocturnal birds, arboreal mammals, terrestrial mammals and frogs. Threatened fauna survey was undertaken in accordance with the following guidelines.

NSW survey guidelines:

- *Threatened reptiles – Biodiversity Assessment Method Survey Guide* (DPE 2022g).
- *Species credit threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (OEH 2018).
- *NSW Survey Guide for Threatened Frogs - A guide for the survey of threatened frogs and their habitats for the Biodiversity Assessment Method* (DPIE 2020c).
- *Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide* (DPE 2022h).
- T*hreatened biodiversity survey and assessment - Guidelines for developments and activities (2004 working draft)* (DEC 2004).

Commonwealth survey guidelines (on the DCCEEW website):

- *Survey Guidelines for Australia's Threatened Bats* (DEWHA 2010a).
- *Survey Guidelines for Australia's Threatened Birds* (DEWHA 2010b).
- *Survey Guidelines for Australia's Threatened Frogs* (DEWHA 2010c).
- *Survey Guidelines for Australia's Threatened Mammals* (DEWHA 2011a).
- Commonwealth of Australia (2011c), *Survey Guidelines for Australia's Threatened Reptiles* (DEWHA 2011b).

Weather conditions during targeted fauna survey are provided in Table 2-8. Data collected from the Bureau of Meteorology (BOM), from the nearest weather station – Camden Airport (Station 068192).

Table 2-8: Weather observations during fauna survey

Date	Surveys undertaken	Min temp (Degrees Celsius)	Max temp (Degrees Celsius)	Wind direction/speed (km/h)	Rain (mm)
3/08/2022	Owl Surveys Diurnal Birds (winter)	5	24.6	NNE - 30 km/h	0

Date	Surveys undertaken	Min temp (Degrees Celsius)	Max temp (Degrees Celsius)	Wind direction/speed (km/h)	Rain (mm)
4/08/2022	Owl surveys	7.3	19.8	N - 67 km/h	0
8/08/2022	Owl Surveys Diurnal Birds (winter)	5.3	17.9	SSE - 30 km/h	0
9/08/2022	Owl Surveys Diurnal Birds (winter)	4	15.2	SW - 31 km/h	0
10/08/2022	Owl surveys	4.8	17.9	SSW - 22 km/h	0.4
11/08/2022	Owl Surveys Diurnal Birds (winter)	6.6	15.9	N - 22 km/h	0
15/08/2022	Owl Surveys Diurnal Birds (winter)	5.9	17	W - 52 km/h	0
16/08/2022	Owl Surveys Diurnal Birds (winter)	1.6	17.9	WSW - 46 km/h	0
12/10/2022	Camera Trapping Diurnal Bird Surveys (Spring) Dusk Bat Surveys	10.6	20.7	ENE - 30 km/h	0
13/10/2022	Camera Trapping Diurnal Bird Surveys (Spring) Dusk Bat Surveys	12.3	21.3	ENE - 39 km/h	0
27/10/2022	Koala SAT surveys and snail surveys	12.1	27.5	WNW - 43 km/h	0
15/11/2022	Camera Trapping Diurnal Bird Surveys (Spring) Dusk Bat Surveys	11.9	25.3	WSW - 33 km/h	0
16/11/2022	Camera Trapping Spotlighting Diurnal Bird Surveys (Spring) Dusk Bat Surveys	6.6	18.9	WSW - 61 km/h	0
17/11/2022	Camera Trapping Spotlighting Dusk Bat Surveys	5.7	20.7	SSE - 30 km/h	0
21/11/2022	Frog surveys	12	21.8	W - 72 km/h	0
22/11/2022	Frog surveys	9.3	21.8	W - 59 km/h	0
29/11/2022	Spring bird surveys	10.8	25.7	WSW - 33 km/h	0
19/12/2022	Frog Surveys Spotlighting Bat Transects	11.8	22.4	SSE - 39 km/h	0
20/12/2022	Frog Surveys Spotlighting Bat Transects	8.2	22.4	SE - 31 km/h	0
21/12/2022	Frog Surveys Spotlighting Bat Transects	9.2	25.7	NE - 31 km/h	0
22/12/2022	Frog Surveys Spotlighting Bat Transects	10.3	22.3	NNE - 26 km/h	0

A summary of the fauna survey is provided in Table 2-9, and shown on Figure 2-3.

Table 2-9: Targeted threatened fauna survey details

Species name	Common name	Required survey period	Associated PCTs	Minimum survey requirements[1]	Survey completed	Present?
Burhinus grallarius	Bush Stone-curlew	All year	849, 1395	Call playback over a minimum two nights. Spotlight survey over two nights.	Call playback completed in two locations, between 2-4km apart. Spotlight survey transects conducted across suitable habitat, repeated on a minimum of two nights (total 15 person hours).	No – Surveys did not detect the species
Callocephalon fimbriatum	Gang-gang Cockatoo	October - January	849, 877, 1181, 1395	Survey of suitable breeding habitat for the presence of the species in the breeding season.	Transects through habitat containing hollows of suitable size in the late afternoon, repeated on a minimum two afternoons in Spring/Summer.	No – Surveys did not detect the species
Pteropus poliocephalus	Grey-headed Flying Fox	N/A – Ecosystem species[1]	849, 1181, 1395	Daytime camp survey.	Survey transects conducted across suitable habitat, Searches up to 100 metres from the edge of the study area for Grey-headed Flying-fox camps	Yes - This species was incidentally recorded during targeted surveys. However, no breeding/roosting habitat for the species was detected
Calyptorhynchus lathami	Glossy Black-Cockatoo	January - September	1181, 1395	Survey of suitable breeding habitat for the presence of the species in the breeding season.	Transects through habitat containing hollows of suitable size in the late afternoon, repeated on a minimum two afternoons in August.	No - Whilst chewed cones were identified, this only indicates a probable sighting which cannot be confirmed. No records of individuals in the breeding season, no nesting identified.
Cercartetus nanus	Eastern Pygmy-possum	October - March	849, 877, 1181, 1395	1km spotlight survey transect per 200 ha of stratification unit, repeated on two separate nights. Baited remote cameras (no	Spotlight survey transects conducted across suitable habitat, repeated on a minimum of two nights (total 15 person hours).	No – Surveys did not detect the species

Species name	Common name	Required survey period	Associated PCTs	Minimum survey requirements[1]	Survey completed	Present?
				species specific current guidelines).	12 arboreal baited remote cameras deployed over 14 nights (168 trap nights).	
Chalinolobus dwyeri	Large-eared Pied Bat	November - January	849, 877, 1181, 1395	Dusk roost watch survey. Acoustic detector survey (2 detectors over a minimum 5 nights).	Dusk roost watch survey. Acoustic detector survey (2 detectors over a minimum 5 nights). Transects using a hand-held detector during frog surveys along waterways on four nights in December.	Yes - Calls characteristic of the species were recorded.
Dasyurus maculatus	Spotted-tailed Quoll	N/A – Ecosystem species[1]	849, 877, 1181, 1395	1km of Spotlight transect completed over 1 hour and repeated on two separate nights (up to 200 ha of stratification unit). Baited remote cameras (no current guidelines).	Spotlight survey transects conducted across suitable habitat, repeated on a minimum of two nights (total 15 person hours).6 baited remote cameras deployed over 14 days (84 trap nights).	No – Surveys did not detect the species
Haliaeetus leucogaster	White-bellied Sea-Eagle	July - December	1395, 849, 1181	Survey for nests during breeding season.	Diurnal bird survey, habitat assessment, and incidental survey during completion of remote camera surveys, Koala SAT surveys.	No – suitable breeding habitat (stick nests) not identified.
Hieraaetus morphnoides	Little Eagle	August - October	1395, 849, 877, 1181	Survey for nests during breeding season.	Diurnal bird survey, habitat assessment, and incidental survey during completion of remote camera surveys, Koala SAT surveys.	No – suitable breeding habitat (stick nests) not identified.
Hoplocephalus bungaroides	Broad-headed Snake	N/A – Ecosystem species[1]	1181	Habitat assessment Rock turning in suitable habitat (where available)	No areas of suitable habitat were identified within the study area or proposal site, high levels of shade occurred in rock outcropping within the study area. Habitat assessment only, no targeted survey undertaken.	No - the habitat constraints for this species were not identified

Species name	Common name	Required survey period	Associated PCTs	Minimum survey requirements[1]	Survey completed	Present?
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	N/A – Ecosystem species[1]	1181	1km of spotlight transect repeated on two separate nights. Baited remote cameras (no species specific current guidelines).	Spotlight survey transects conducted across suitable habitat, repeated on a minimum of two nights (total 15 person hours).7 terrestrial remote cameras baited with universal bait over 14 days (98 trap nights)	No – Surveys did not detect the species
Litoria littlejohni	Littlejohn's Tree Frog	July - November	None	1 x 500m transect per 1000m of suitable breeding habitat (up to 5km) repeated over 4 nights.	The equivalent of 2 x 500m aural-visual transects undertaken across the proposal site (1500m of waterway), repeated on four nights. Up to 1500m of waterway surveyed (pro-rated effort) across 7 segments of waterway throughout the study area.	No – Surveys did not detect the species
Lophoictinia isura	Square-tailed Kite	September - January	849, 1181, 1395	Survey for nests during breeding season.	Diurnal bird survey, habitat assessment, and incidental survey during completion of remote camera surveys, Koala SAT surveys.	No – Surveys did not detect the species
Meridolum corneovirens	Cumberland Plain Land Snail	All year	849, 1395	Snail survey methods not defined. Biosis utilise a method developed from Koala SAT survey to conduct standardised repeatable survey units.	Five Snail survey points conducted across the study area. Each survey point included completion of a search around and under a minimum 30 habitat features.	No – Surveys did not detect the species
Miniopterus australis	Little Bent-winged Bat	December - February	1395, 849, 877, 1181	Minimum 16 trap nights for acoustic detectors, requiring minimum deployment of four nights. Dusk stag watch of potential roost habitat in bridges.	Recorded in the study area by acoustic detectors (NGH 2022). Additional survey effort not required. Dusk stag watch of potential roost structures completed on two separate nights, 30 minutes prior to sunset and one hour following sunset.	Yes – Foraging habitat only. Calls characteristic of the species were recorded.

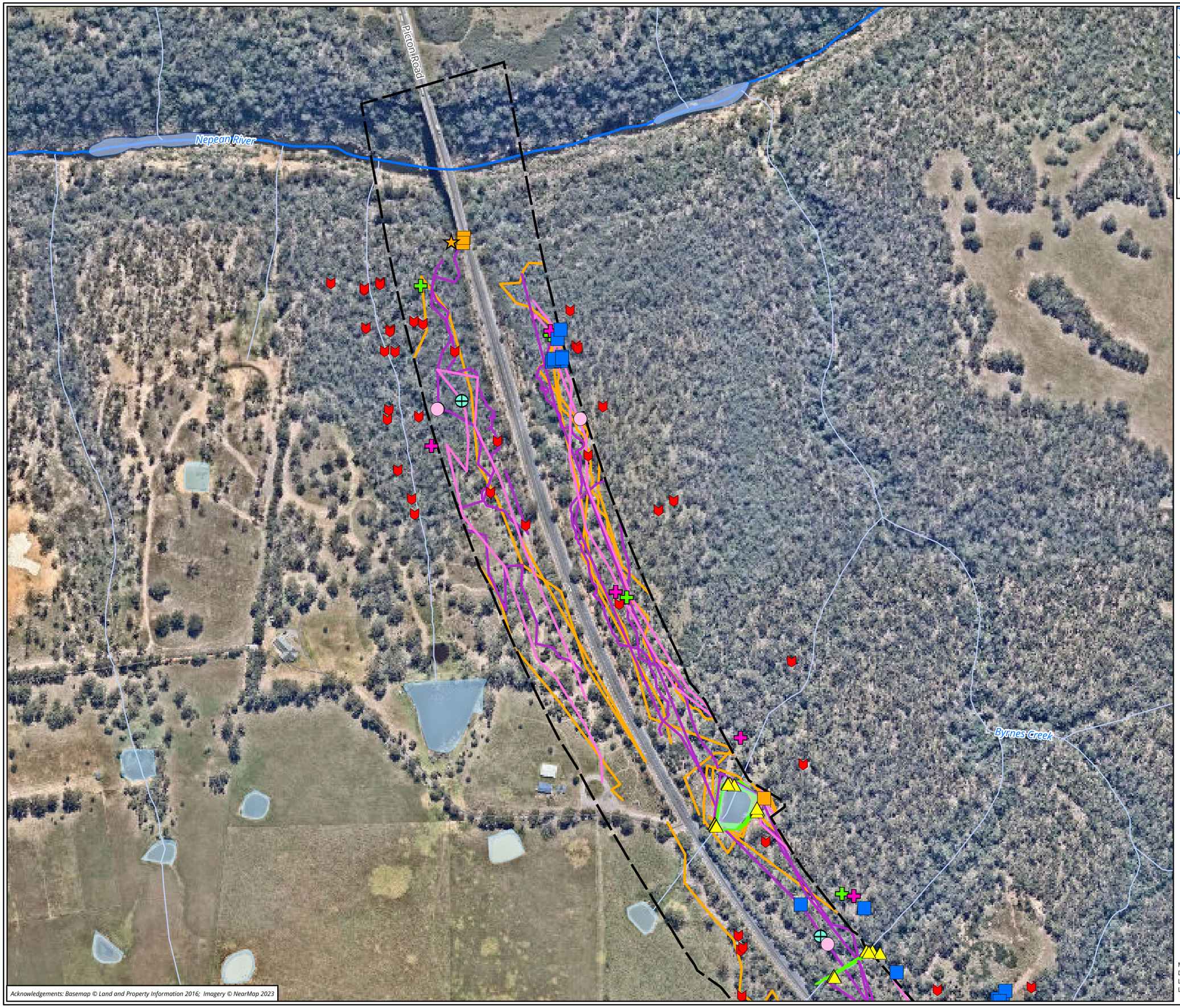
Species name	Common name	Required survey period	Associated PCTs	Minimum survey requirements[1]	Survey completed	Present?
					Transects using a hand-held detector during frog surveys along waterways on four nights in December.	
Miniopterus orianae oceanensis	Large Bent-winged Bat	December - February	1395, 849, 877, 1181	Minimum 16 trap nights for acoustic detectors, requiring minimum deployment of four nights. Dusk stag watch of potential roost habitat in bridges.	Potential calls recorded in the study area by acoustic detectors (NGH 2022). Additional survey effort not required. Dusk stag watch of potential roost structures completed on two separate nights, 30 minutes prior to sunset and one hour following sunset. Transects using a hand-held detector during frog surveys along waterways on four nights in December.	Yes – Foraging habitat only. Calls characteristic of the species were recorded.
Myotis macropus	Southern Myotis	October - March	1395, 849, 877, 1181	Minimum 16 trap nights for acoustic detectors, requiring minimum deployment of four nights. Dusk stag watch of potential roost habitat in bridges.	Potential calls recorded in the study area by acoustic detectors (NGH 2022). Recorded during dusk stag watch of potential roost structures which were completed on two separate nights, 30 minutes prior to sunset and one hour following sunset. Transects using a hand-held detector during frog surveys along waterways on four nights in December.	Yes – Species were observed during surveys.
Neophema pulchella	Turquoise Parrot	N/A – Ecosystem species[1]	849, 1395	Diurnal bird survey repeated twice	Bird survey conducted during winter and spring across habitat within the study area.	No – Surveys did not detect the species
Ninox connivens	Barking Owl	May - December	1395, 849, 1181	Call playback survey undertaken at sites separated by a minimum 800m and maximum 1000m, repeated on a minimum of 5 separate nights	Habitat assessment for suitably sized hollows. Call playback undertaken at three sites (in areas with suitable hollows) throughout the study area, repeated on a minimum of 5 separate nights	No – Surveys did not detect the species

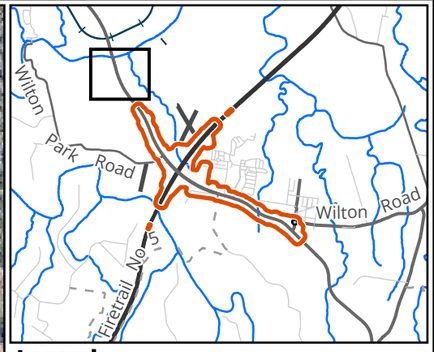
Species name	Common name	Required survey period	Associated PCTs	Minimum survey requirements[1]	Survey completed	Present?
Ninox strenua	Powerful Owl	May - August	1395, 849, 877, 1181	Call playback survey undertaken at sites separated by a minimum 800m and maximum 1000m, repeated on a minimum of 5 separate nights	Habitat assessment for suitably sized hollows. Call playback undertaken at three sites throughout the study area, repeated on a minimum of 5 separate nights	No – Surveys did not detect the species
Pandion cristatus	Eastern Osprey	N/A – Ecosystem species[1]	None	Survey for nests during breeding season.	Diurnal bird survey, habitat assessment, and incidental survey during completion of remote camera surveys, Koala SAT surveys.	No – Surveys did not detect the species
Petauroides volans	Greater Glider	All year	1395, 849, 1181	1km spotlight survey transect per 50 ha of stratification unit, repeated over two separate nights.	Spotlight survey transects conducted across suitable habitat, repeated on a minimum of two nights (total 15 person hours).	No – Surveys did not detect the species
Petaurus norfolcensis	Squirrel Glider	All year	1395, 849, 1181	1km spotlight survey transect per 200 ha of stratification unit, repeated on two separate nights. Baited remote cameras (no species-specific current guidelines).	Spotlight survey transects conducted across suitable habitat, repeated on a minimum of two nights (total 15 person hours). 12 arboreal baited remote cameras deployed over 14 nights (168 trap nights).	No – Surveys did not detect the species
Phascolarctos cinereus	Koala	All year	1395, 849, 877, 1181	2x 200m transect per 5ha suitable habitat, repeated over two nights.	8 SAT point surveys undertaken in October. Spotlight survey of suitable habitat, repeated twice. Species assumed present.	Yes - Recorded from the presence of scats located in vegetation adjacent to the study area
Pommerhelix duralensis	Dural Land Snail	All year	1395, 849, 1181	Snail survey methods not defined. Biosis utilise a method developed from Koala SAT survey to conduct standardised repeatable survey units.	Five snail survey points conducted across the study area. Each survey point included completion of a search around and under a minimum 30 habitat features.	No – Surveys did not detect the species

Species name	Common name	Required survey period	Associated PCTs	Minimum survey requirements[1]	Survey completed	Present?
Pseudophryne australis	Red-crowned Toadlet	All year	1181, 1395	1 x 500m transect per 1000m of suitable breeding habitat (up to 5km) repeated over 4 nights.	The equivalent of 2 x 500m aural-visual transects undertaken across the proposal site (1500m of waterway), repeated on four nights. Up to 1500m of waterway surveyed (pro-rated effort) across 7 segments of waterway throughout the study area.	No – Surveys did not detect the species
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	N/A – Ecosystem species[1]	1395, 849, 877, 1181	No species-specific guideline. As per species credit bat guidelines, minimum effort of 4 detectors over 4 nights (16 detector nights).	Recorded in the study area by acoustic detectors (NGH 2022), additional survey effort not required. Transects using a hand-held detector during frog surveys along waterways on four nights in December.	Yes - Calls characteristic of the species were recorded.
Scoteanax rueppellii	Greater Broad-nosed Bat	N/A – Ecosystem species[1]	1395, 849, 877, 1181	No species-specific guideline. As per species credit bat guidelines, minimum effort of 4 detectors over 4 nights (16 detector nights).	Recorded in the study area by acoustic detectors, additional survey effort not required. Transects using a hand-held detector during frog surveys along waterways on four nights in December.	Yes - Calls characteristic of the species were recorded.
Stagonopleura guttata	Diamond Firetail	N/A – Ecosystem species[1]	1395, 849, 877	Diurnal bird survey repeated twice	Bird survey conducted during winter and spring across habitat within the study area.	No – Surveys did not detect the species
Tyto novaehollandiae	Masked Owl	May - August	1395, 849, 877, 1181	Call playback survey undertaken at sites separated by a minimum 800m and maximum 1000m, repeated on a minimum of 8 separate nights	Habitat assessment for suitably sized hollows. Call playback undertaken at three sites throughout the study area, repeated on a minimum of 5 separate nights	Yes - This species was incidentally recorded during targeted surveys. However, no breeding/roosting habitat for the species was detected
Tyto tenebricosa	Sooty Owl	April - August	1395, 877	Call playback survey undertaken at sites separated by a minimum	Habitat assessment for suitably sized hollows. Call playback undertaken at	No – Surveys did not detect the species

Species name	Common name	Required survey period	Associated PCTs	Minimum survey requirements[1]	Survey completed	Present?
				800m and maximum 1000m, repeated on a minimum of 6 separate nights	three sites throughout the study area, repeated on a minimum of 5 separate nights	

[1] - Ecosystem species do not generally require targeted survey. Ecosystem species mentioned above were surveyed for as they are EPBC Act listed species with a moderate or higher likelihood of occurrence.





Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects
- Spotlight survey
- Diurnal bird survey - Spring
- Glossy Black-Cockatoo survey - Winter transects
- Hollow-bearing tree
- Koala SAT survey
- Snail survey
- Bat detector (NGH)
- Dusk roost watch

Remote camera

- Terrestrial
- Arboreal

Call playback

- Owl
- Frogs

Figure 2-2: Threatened fauna targeted survey effort Page 1

0 50 100

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

Matter: 36086, Date: 17 October 2023
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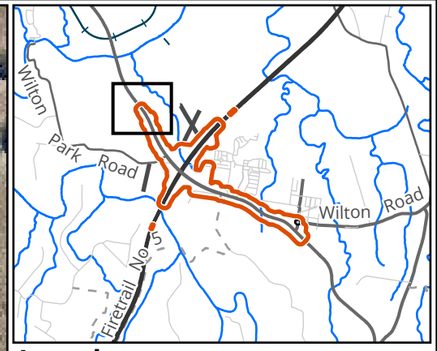

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects
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- Diurnal bird survey - Spring
- Glossy Black-Cockatoo survey - Winter transects
- Hollow-bearing tree
- Koala SAT survey
- Snail survey
- Dusk roost watch

Remote camera

- Terrestrial
- Arboreal

Call playback

- Owl
- Frogs

Figure 2-2: Threatened fauna targeted survey effort Page 2

0 50 100

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

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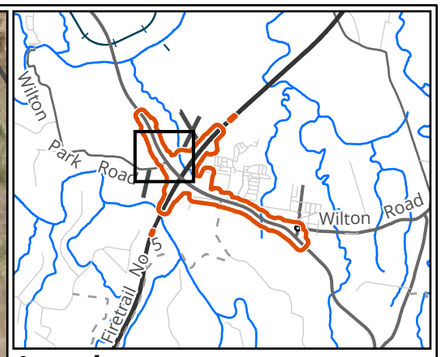

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects
- Spotlight survey
- Hollow-bearing tree
- Koala SAT survey
- Snail survey

Call playback

- Frogs

Byrnes Creek

Wilton Park Road

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Figure 2-2: Threatened fauna targeted survey effort Page 3

0 50 100

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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biosis

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Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

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Figure 2-2: Threatened fauna targeted survey effort
Page 4

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Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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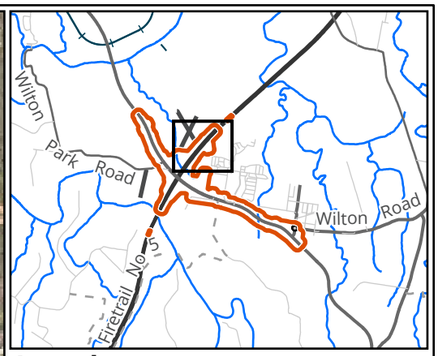

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects
- Spotlight survey
- Hollow-bearing tree
- Koala SAT survey
- Snail survey

Call playback

- Frogs

Figure 2-2: Threatened fauna targeted survey effort Page 5

0 50 100

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

biosis

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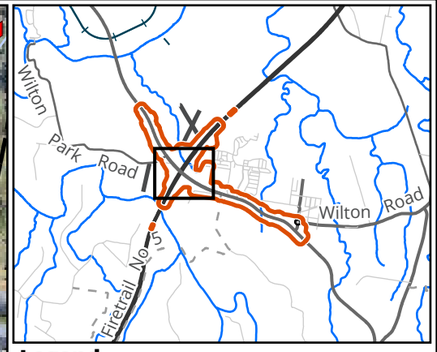

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects
- Spotlight survey
- Diurnal bird survey - Spring
- Hollow-bearing tree
- Koala SAT survey
- Snail survey
- Dusk roost watch

Remote camera

- Terrestrial
- Arboreal

Call playback

- Frogs

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Figure 2-2: Threatened fauna targeted survey effort
Page 6

0 50 100
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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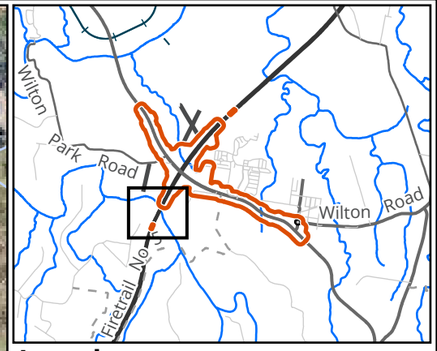

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Spotlight survey
- Diurnal bird survey - Spring
- Hollow-bearing tree
- Koala SAT survey
- Snail survey

Remote camera

- Terrestrial
- Arboreal

Call playback

- Owl

Nepean River

Hume Motorway

Nepean River

Figure 2-2: Threatened fauna targeted survey effort Page 7

0 50 100

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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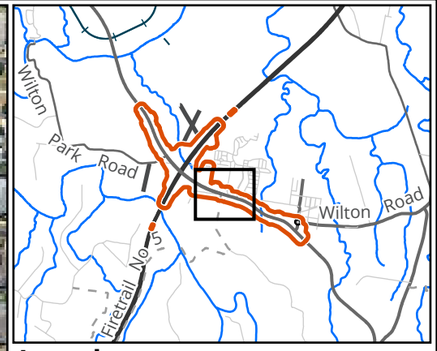

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects
- Spotlight survey
- Hollow-bearing tree
- Koala SAT survey
- Snail survey
- Bat detector (NGH)
- Dusk roost watch

Remote camera

- Terrestrial
- Arboreal

Call playback

- Frogs

Firetrail No 11a

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Figure 2-2: Threatened fauna targeted survey effort
Page 8

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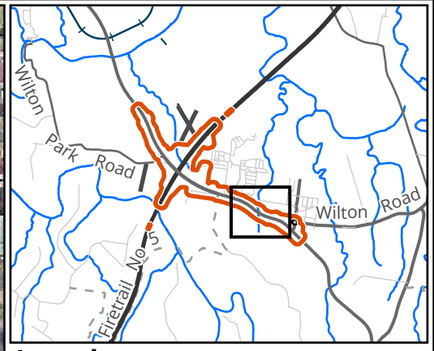

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects

Call playback

- Frogs

Figure 2-2: Threatened fauna targeted survey effort
Page 9

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Coordinate System: GDA2020 MGA Zone 56

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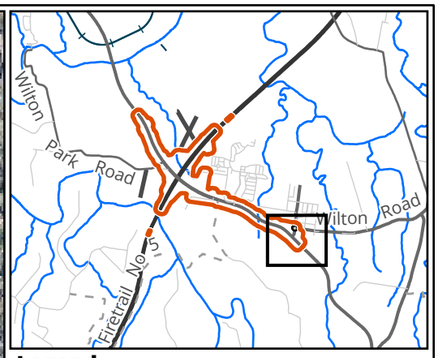

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area
- Frog survey transects
- Hollow-bearing tree

Call playback

- Frogs

Figure 2-2: Threatened fauna targeted survey effort
Page 10

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Coordinate System: GDA2020 MGA Zone 56

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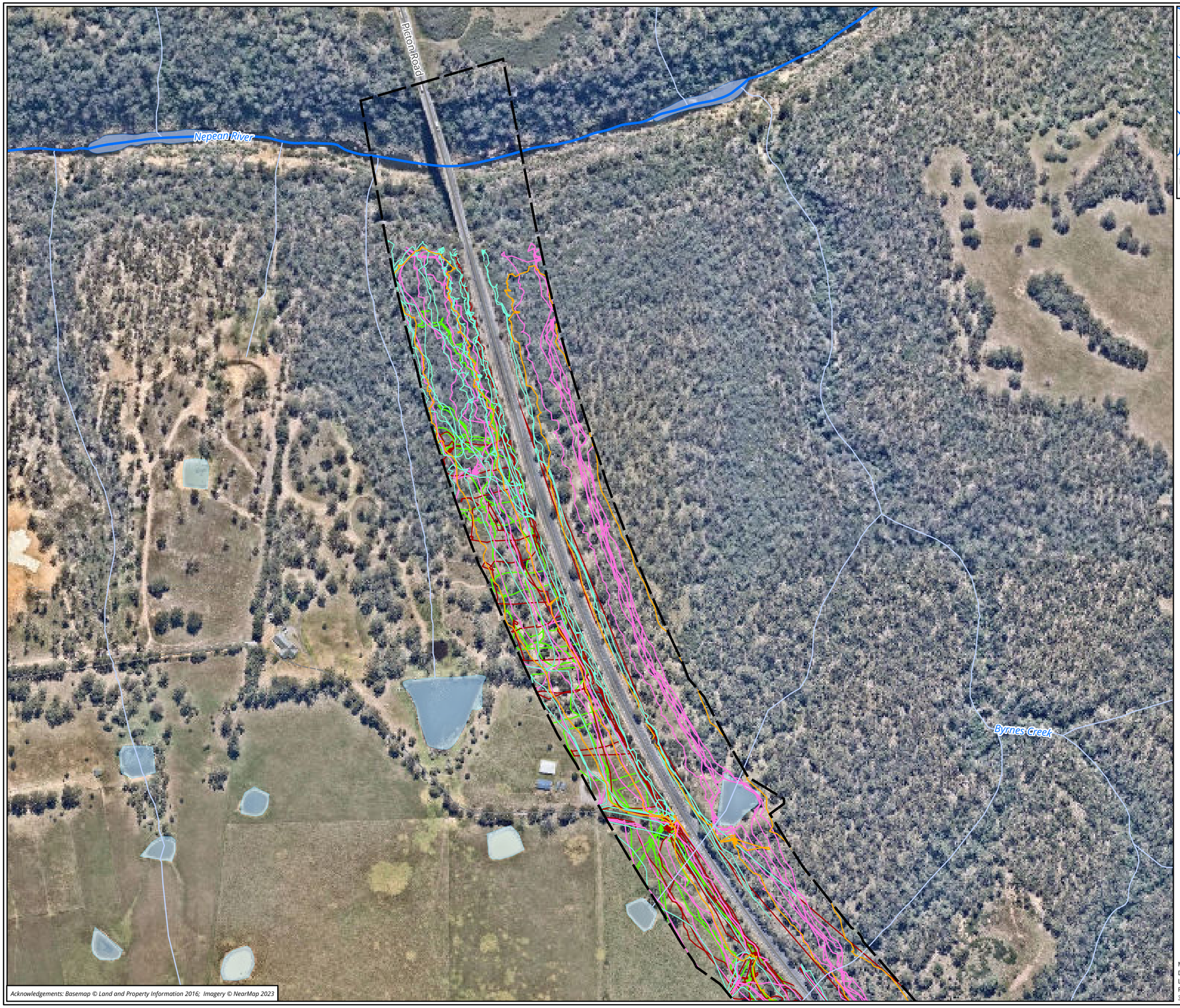

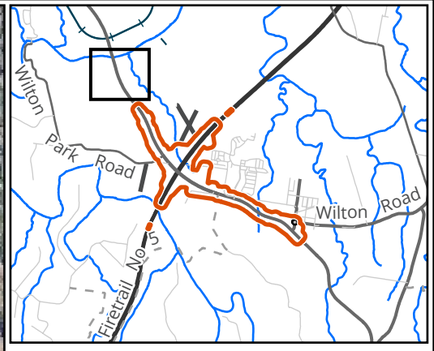

Legend

- Study area
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Figure 2-3: Threatened flora survey effort
Page 1

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Metres
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Coordinate System: GDA2020 MGA Zone 56

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biosis

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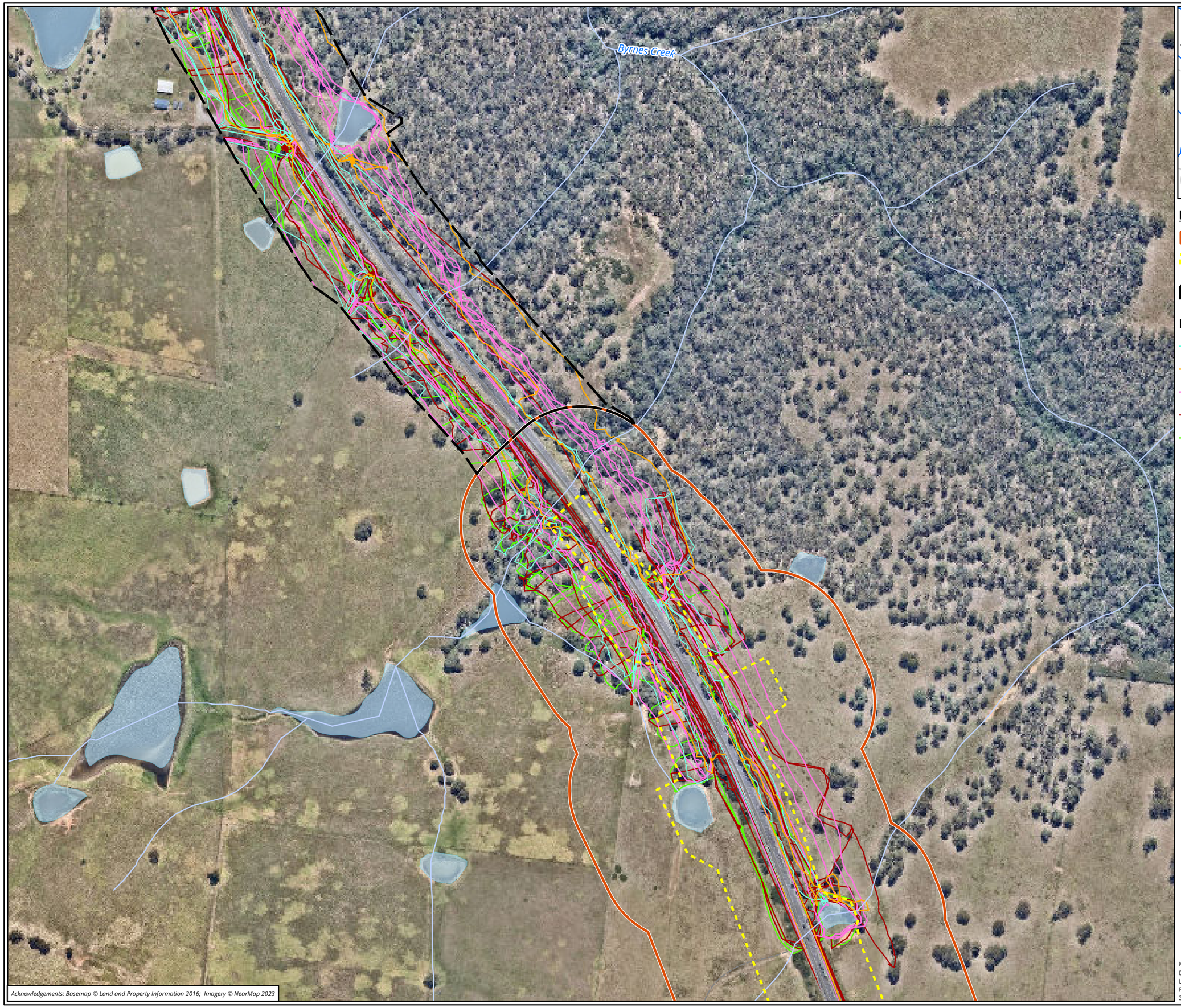

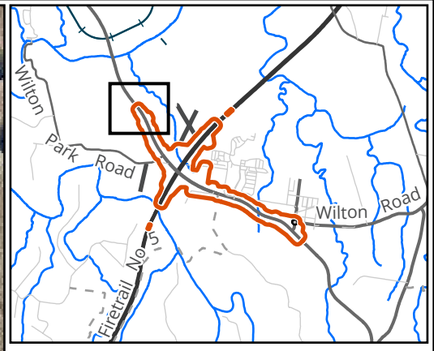

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Figure 2-3: Threatened flora survey effort
Page 2

0 50 100
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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biosis

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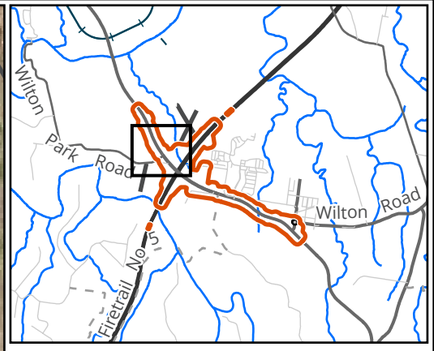

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- Study area
- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Byrnes Creek

Wilton Park Road

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Figure 2-3: Threatened flora survey effort
Page 3

0 50 100
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

N

biosis

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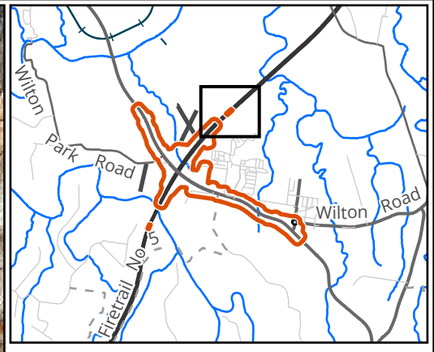

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- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Figure 2-3: Threatened flora survey effort
Page

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Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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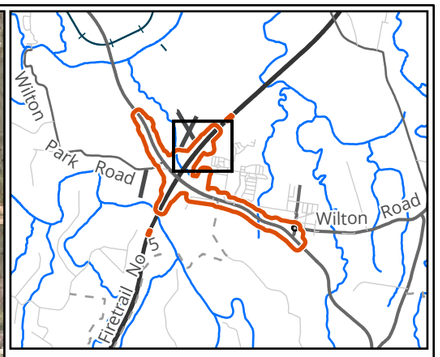

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- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Figure 2-3: Threatened flora survey effort
Page 4

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Metres
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Coordinate System: GDA2020 MGA Zone 56

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biosis

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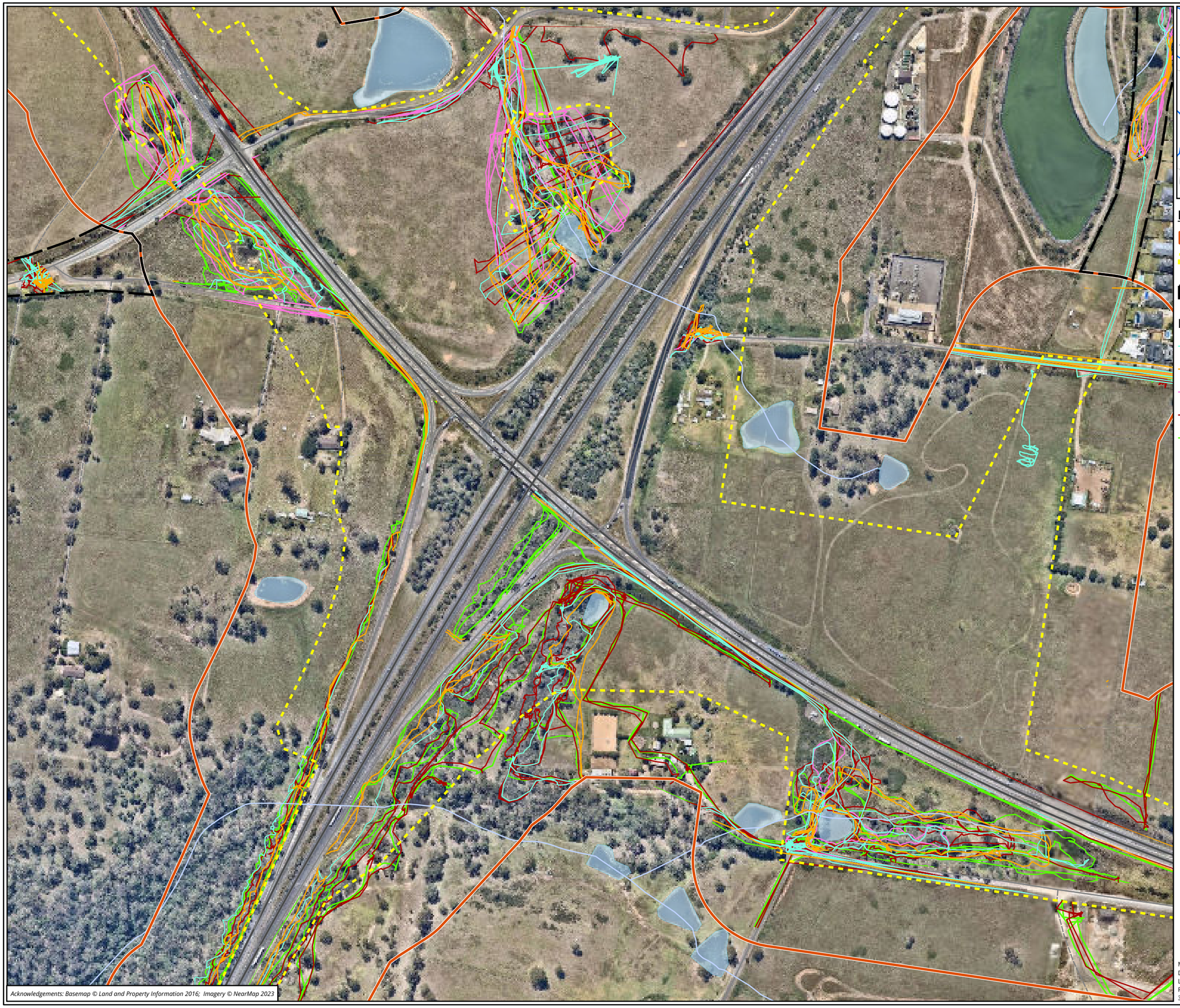

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- Study area
- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

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Figure 2-3: Threatened flora survey effort
Page 5

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Coordinate System: GDA2020 MGA Zone 56

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biosis

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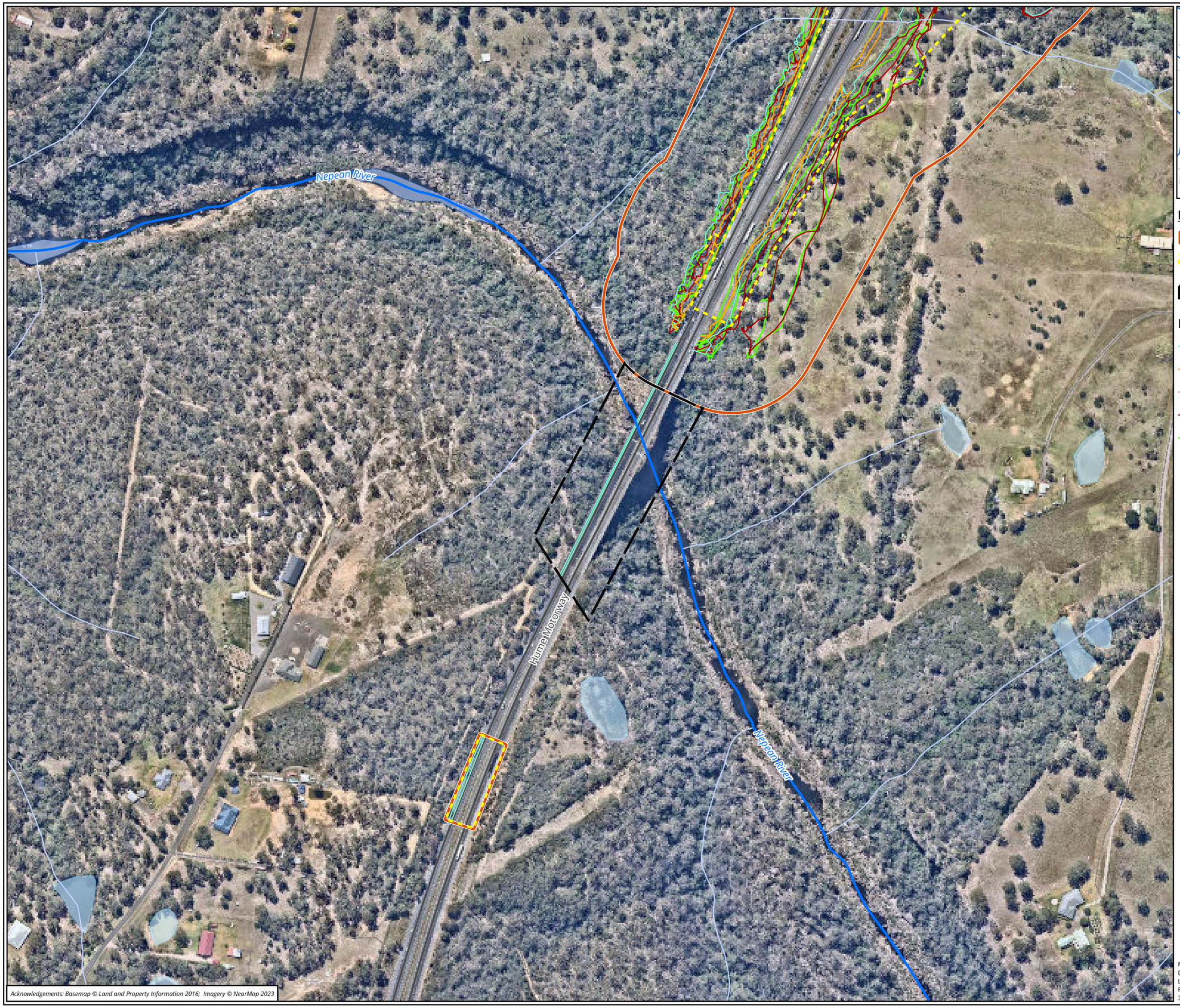

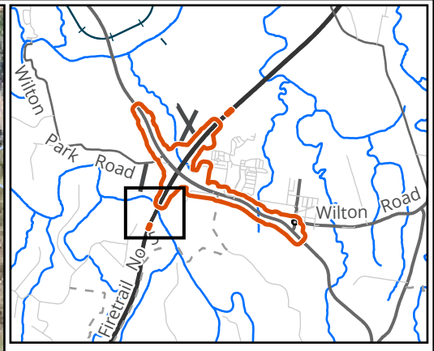

Legend

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- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Figure 2-3: Threatened flora survey effort
Page 6

0 50 100
Metres
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Coordinate System: GDA2020 MGA Zone 56

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biosis

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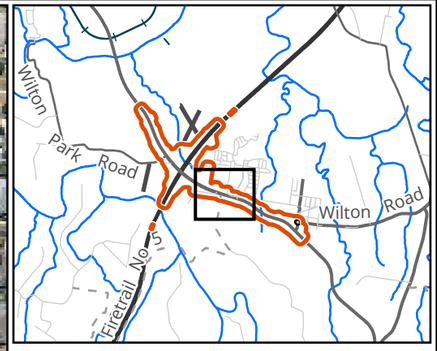

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- Biodiversity survey area outside of study area

Flora survey transcripts (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Firetrail No 11a

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Figure 2-3: Threatened flora survey effort
Page 7

0 50 100
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

N

biosis

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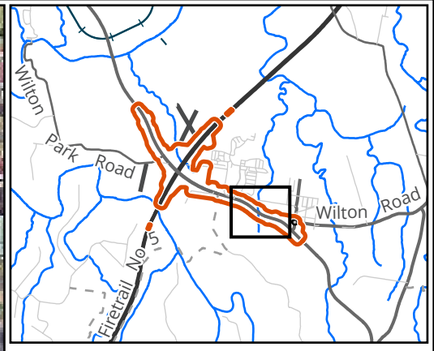

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- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Figure 2-3: Threatened flora survey effort
Page 8

0 50 100
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

N

biosis

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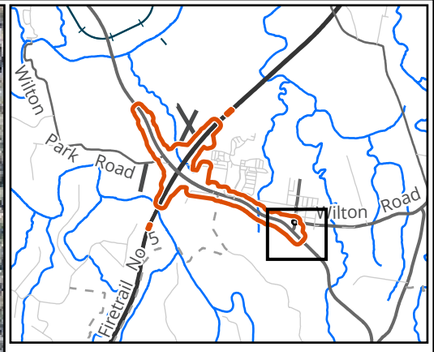

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Flora survey transects (Biosis)

- January 2023
- December 2022
- November 2022
- October 2022
- September 2022

Figure 2-3: Threatened flora survey effort
Page 9

0 50 100
Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

N

biosis

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2.5 Aquatic surveys

A high-level desktop assessment was undertaken and verified during field surveys to determine habitat availability for aquatic flora and fauna within the study area. Section 3.2 of the Policy and guidelines for fish habitat conservation and management (Fairfull 2013) provides a defined methodology for identifying and classifying Key Fish Habitat. This methodology is a higher resolution approach than the mapping produced by DPI (DPI 2023). As such, Fairfull (2013) is considered the most meaningful approach to achieve the goals of the FM Act and supporting guidelines. Fairfull (2013) uses defined characteristics to establish type and class grades for each waterway by considering both the relative sensitivity and functionality of the waterways. Therefore, guidelines presented by Fairfull (2013) were used in this assessment to identify and classify Key Fish Habitat.

2.6 Limitations

It is a recognised limitation that not all species present within an area are detectable at any one time or year over year. The random meander and plot-based surveys undertaken were carried out across varying seasons (spring and summer) providing a list of flora species readily detectable for those points in time. Repeated survey at the same locations over several seasons or years during ranging weather conditions may be required to detect all the species present. Therefore, the cover and abundance of native species recorded within each plot is assuredly less than what is truly present. As cover and abundance of native species is a key contributor to calculating vegetation integrity, the vegetation integrity scores for each vegetation zone within the proposal site are limited by the season in which the plot data was collected.

With regard to targeted surveys for threatened flora, access constraints prevented some areas from being surveyed, resulting in some species (see section 2.4.5) being unable to be suitably surveyed for during their optimal survey period. To overcome this limitation, effort was made to complete visual inspections from adjacent areas, and surveys outside of the respective survey period for each species was completed by a senior botanist where possible. Where surveys were considered inadequate to determine species presence/absence, presence was assumed, and impacts were considered. Mitigation measures (section 6) have also recommended that if applicable, further targeted surveys in these missed areas should be completed (within the optimal survey period for each respective species) prior to the commencement of works.

3. Existing environment

The study area is located in the Sydney suburb of Wilton, approximately 64 kilometres south-west of the Sydney central business district (CBD) and 30 kilometres north-west of Wollongong. The study area has been subject to modification through urban, agricultural and infrastructure development. The study area is located with the Sydney Basin Interim Biogeographic Regionalisation of Australia (IBRA) bioregion and mostly within the Cumberland IBRA subregion, with a small portion of the southern section of the study area occurring in the Sydney Cataract subregion.

Regional soil landscape mapping indicates that the study area occurs on the Razorback Hills and Upper Nepean Gorges soil landscapes (Mitchell 2002). The Razorback Hills soil landscape is categorised by a plateau ridge with steep slopes. The upper Triassic shale, carbonaceous claystone, and lithic sandstone that make up the soil are arranged horizontally. The slopes above 120 degrees are prone to extensive earthflows. The general elevation of the area ranges from 180 to 300 metres, and the local relief is 90 metres. The soils are harsh and have a texture-contrast, appearing in shades of red, brown, or yellow. The subsoil of these soils is composed of reactive clay.

The Upper Nepean Gorges soil landscape is characterised by steep-sided, benched slopes that are part of the Nepean River tributaries. The slopes are composed of Triassic quartz sandstones and have a general elevation of 250 to 350 metres, with a local relief of 80 metres. The benches on the slopes have shallow, well-drained sands and are underlain by clayey sandstone with thin shale units. The soil in this area has limited development of yellow texture-contrast soils. The vegetation of these landscapes consists of extensively cleared open-forest and open-woodland, with land used primarily for intensive residential, agricultural, industrial and recreational purposes.

The study area intersects several waterways and aquatic environments, as defined in section 3.8.

3.1 Native vegetation extent

The study area consists of multilane arterial roadways (comprising Picton Road and the M31 Hume Motorway) and predominantly cleared land with patches of remnant and planted vegetation, which is primarily used for residential, recreational, industrial and agricultural purposes. Within the study area, vegetation is connected to the riparian corridor of the Nepean River, which is comprised of intact, continuous vegetation. Vegetation also consists of small remnant patches occurring along the road verges of Picton Road and within private properties within and adjacent to the study area. The majority of roadside vegetation observed is subject to edge effects and disturbance including weed ingress, however higher condition patches are present and consisted of high floristic and structural diversity. Several TECs are present within the study area and are detailed below.

The extent of native vegetation, and exotic vegetation in the study area is summarised below in .

Table 3-1. The native PCTs in the proposal site are described below in section 3.3.

Table 3-1: Extent of vegetation types within the study area and proposal site

Native vegetation (ha) within study area	35.50
Native vegetation (ha) within proposal site	13.10
Exotic vegetation (UNE and NOG) (ha) within study area	213.20
Exotic vegetation (UNE and NOG) (ha) within proposal site	70.16

3.2 Plant community types and vegetation zones

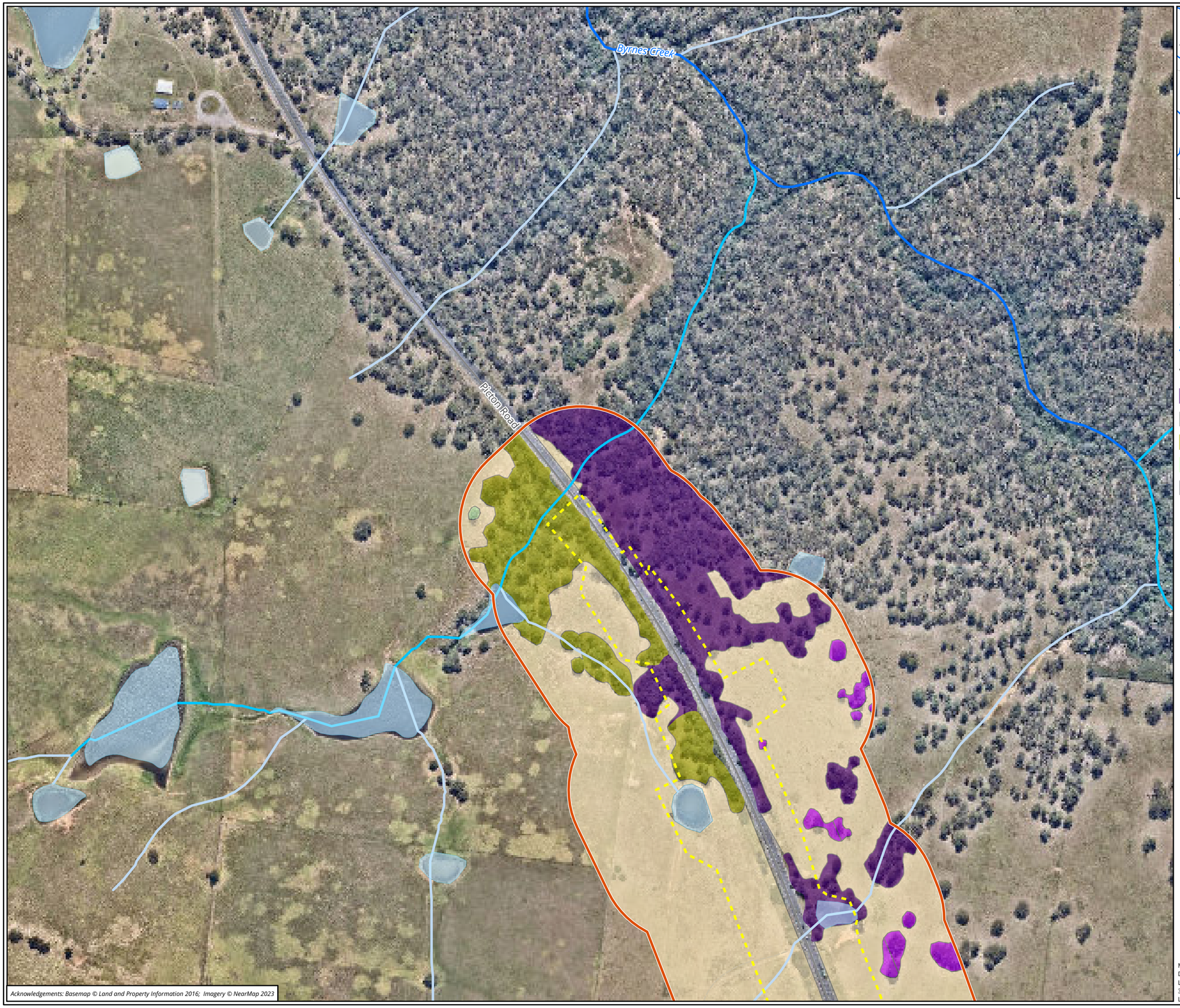
The PCTs assessed as present within the study area are outlined in Table 3-2 and displayed on Figure 3-1. Profiles for each mapped PCT are also provided in the subsequent sections.

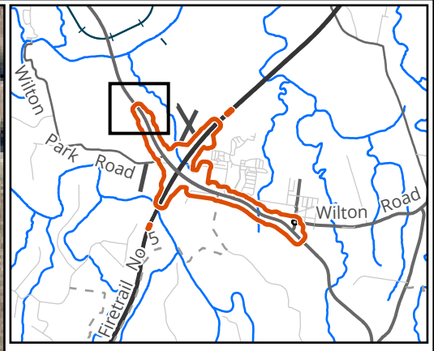
The proposal site (including Certified - urban capable land) comprises a total of 13.10 hectares of native vegetation communities comprising of two PCTs in various condition states. The remainder of the proposal site comprises of 19.40 hectares of Exotic/urban native vegetation and 50.76 hectares of NoG.

Table 3-2: Plant community types and vegetation zones including patch size and vegetation integrity (VI) score

PCT	Veg. zone	Threatened ecological community	Area (ha)		Patch size class	VI score
			Study area	Proposal site		
PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Zone 1_Moderate	Critically Endangered Ecological Community (BC Act and EPBC Act)	10.01	4.01	<5 ha	58.3
	Zone 2_Scattered Trees	Critically Endangered Ecological Community (BC Act)	1.11	0.03	<5 ha	2.5
	Zone 3_DNS	Critically Endangered Ecological Community (BC Act)	2.06	1.20	<5 ha	24.8
	Zone 4_DNG	Critically Endangered Ecological Community (BC Act)	1.18	0.53	<5 ha	28.3
PCT 1181 Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	Zone 5_High	Not a TEC	0.13	0 (present in study area only)	<5 ha	67.4
PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Zone 6_High	Critically Endangered Ecological Community (BC Act and EPBC Act)	3.54	0.05	<5 ha	80.4
	Zone 7_Moderate	Critically Endangered Ecological Community (BC Act and EPBC Act)	3.35	1.40	<5 ha	69.3
	Zone 8_Low	Critically Endangered Ecological Community (BC Act and EPBC Act)	11.74	5.14	5–24 ha	58.3
	Zone 9_Scattered Trees	Critically Endangered Ecological Community (BC Act)	1.02	0.42	<5 ha	12.7
	Zone 10_DNS	Critically Endangered Ecological Community (BC Act)	0.32	0.32	<5 ha	4.9

PCT	Veg. zone	Threatened ecological community	Area (ha)		Patch size class	VI score
			Study area	Proposal site		
PCT 877 Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion	Zone 11_High	Not a TEC	1.05	0 (present in study area only)	<5 ha	99.8 (Benchmark)





Legend

- Study area
- Proposal site

Strahler order

- 1
- 2
- 3

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Non-offsettable grassland

Figure 3-1: Vegetation zones
Page 1

0 50 100 150

Meters

Scale: 1:4,000 @ A3

Coordinate System:
GDA2020 MGA Zone 56

N

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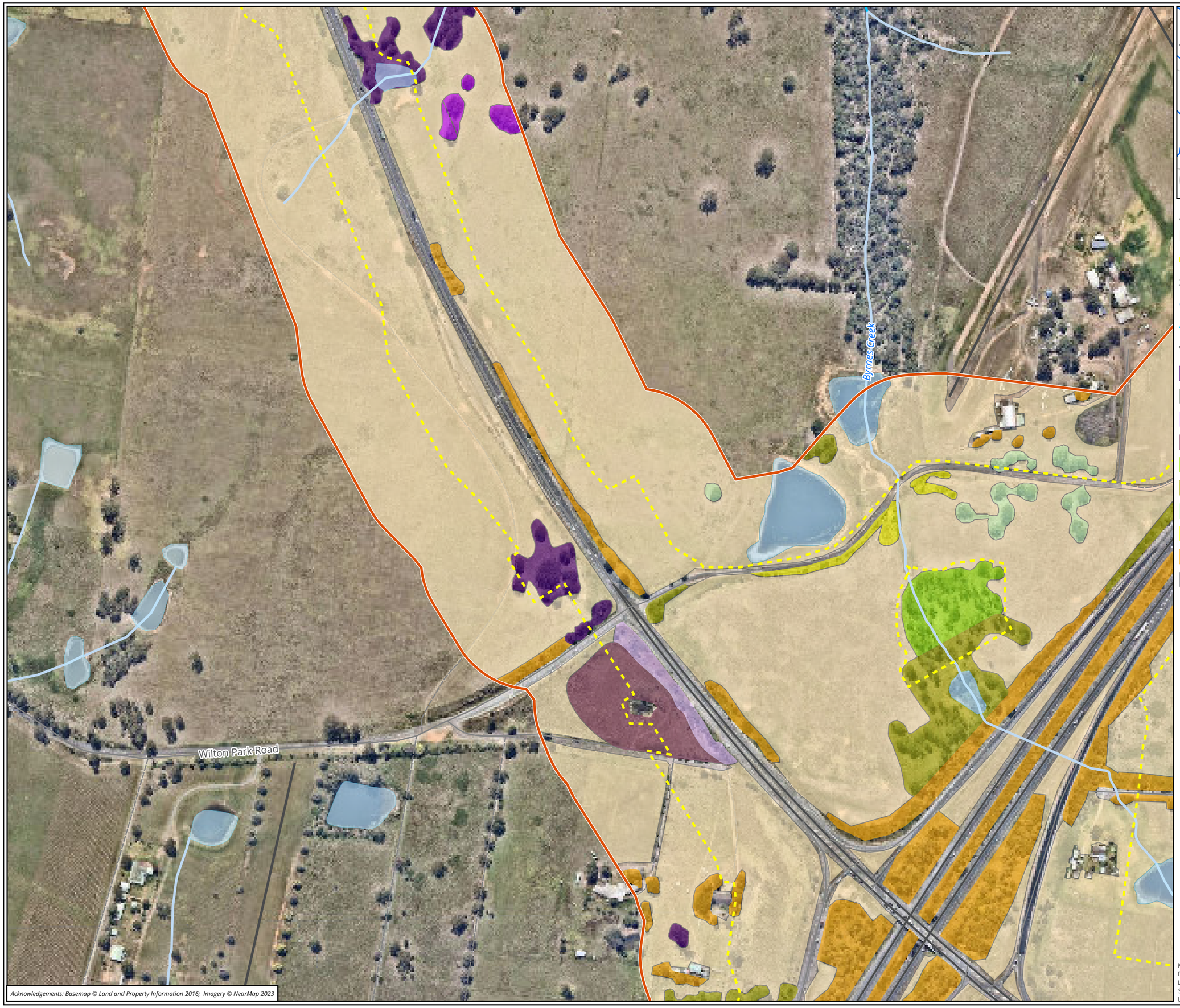

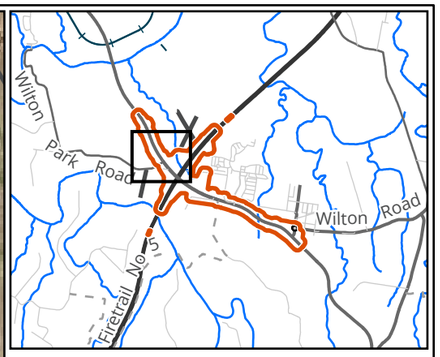

Legend

- Study area
- Proposal site

Strahler order

- 1
- 2

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 3_PCT849_DNS
- Zone 4_PCT849_DNG
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS
- Urban Native/Exotic
- Non-offsettable grassland

Figure 3-1: Vegetation zones Page 2

0 50 100 150

Meters

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

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Figure 3-1: Vegetation zones
Page 3

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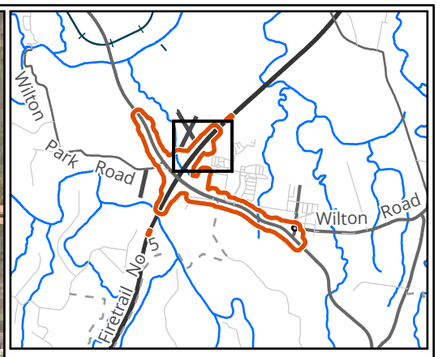

Legend

- Study area
- Proposal site

Strahler order

- 1
- 2

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS
- Urban Native/Exotic
- Non-offsettable grassland

Figure 3-1: Vegetation zones
Page 4

0 50 100 150
Meters
Scale: 1:4,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

N

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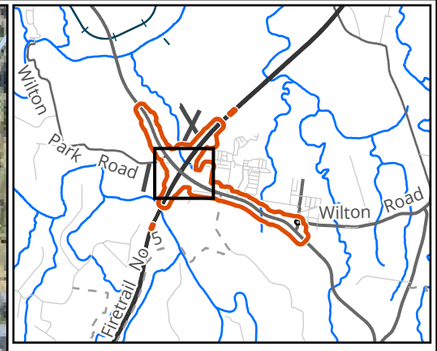

Legend

Study area

Proposal site

Strahler order

1

2

Vegetation zone

Zone 1_PCT849_Moderate

Zone 3_PCT849_DNS

Zone 4_PCT849_DNG

Zone 6_PCT1395_High

Zone 7_PCT1395_Moderate

Zone 8_PCT1395_Low

Zone 9_PCT1395_Scattered Trees

Zone 10_PCT1395_DNS

Zone 11_PCT877_High

Urban Native/Exotic

Non-offsettable grassland

Figure 3-1: Vegetation zones
Page 5

0 50 100 150

Meters

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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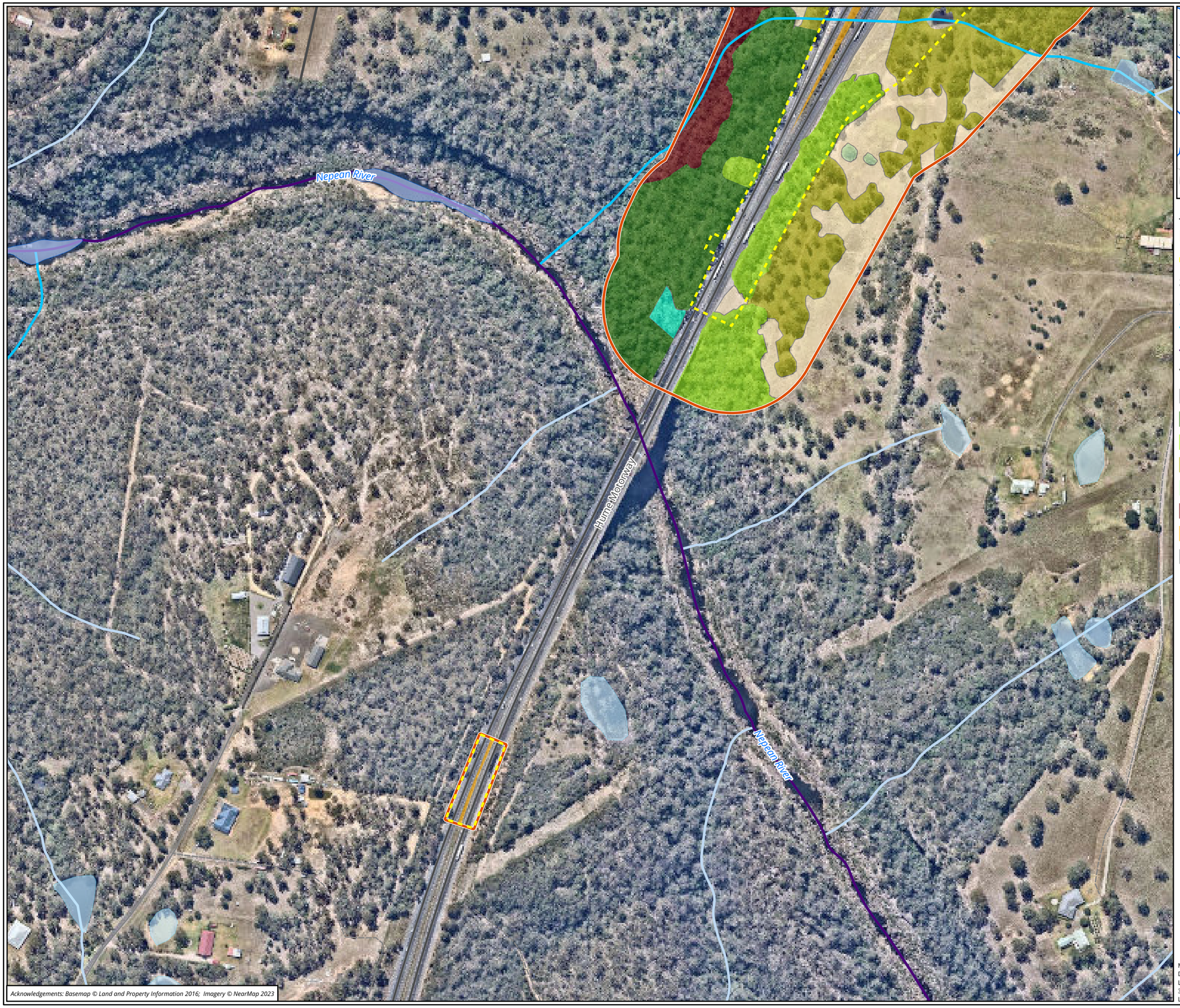

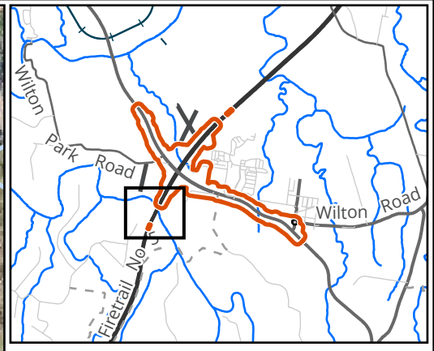

Legend

- Study area
- Proposal site

Strahler order

- 1
- 2
- 7

Vegetation zone

- Zone 5_PCT1181_High
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 11_PCT877_High
- Urban Native/Exotic
- Non-offsettable grassland

Figure 1-3: Vegetation zones
Page 6

0 50 100 150
Meters
Scale: 1:4,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

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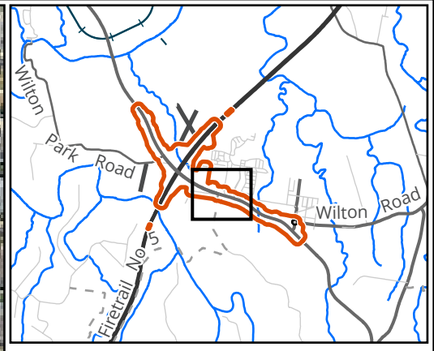

Legend

- Study area
- Proposal site

Strahler order

- 1
- 2

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 3_PCT849_DNS
- Urban Native/Exotic
- Non-offsettable grassland

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Figure 3-1: Vegetation zones
Page 7

0 50 100 150
Meters
Scale: 1:4,000 @ A3
Coordinate System:
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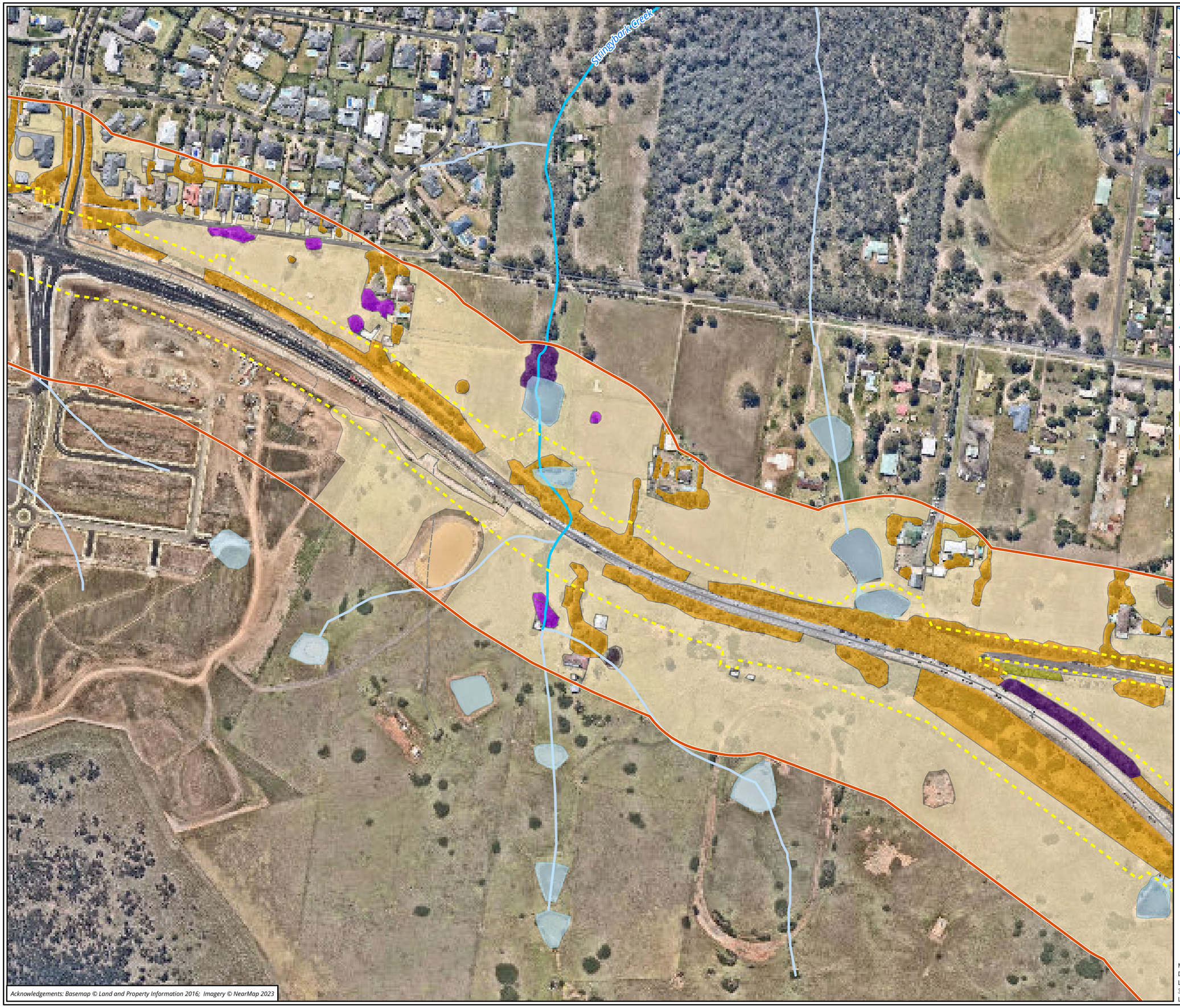

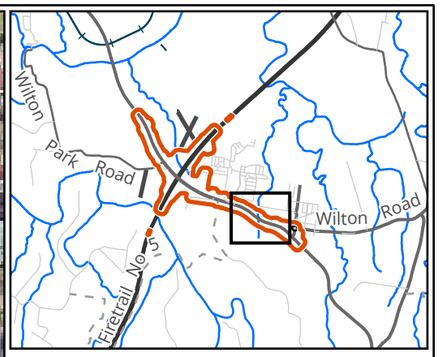

Legend

- Study area
- Proposal site

Strahler order

- 1
- 2

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low
- Urban Native/Exotic
- Non-offsettable grassland

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Figure 3-1: Vegetation zones
Page 8

0 50 100 150
Meters
Scale: 1:4,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

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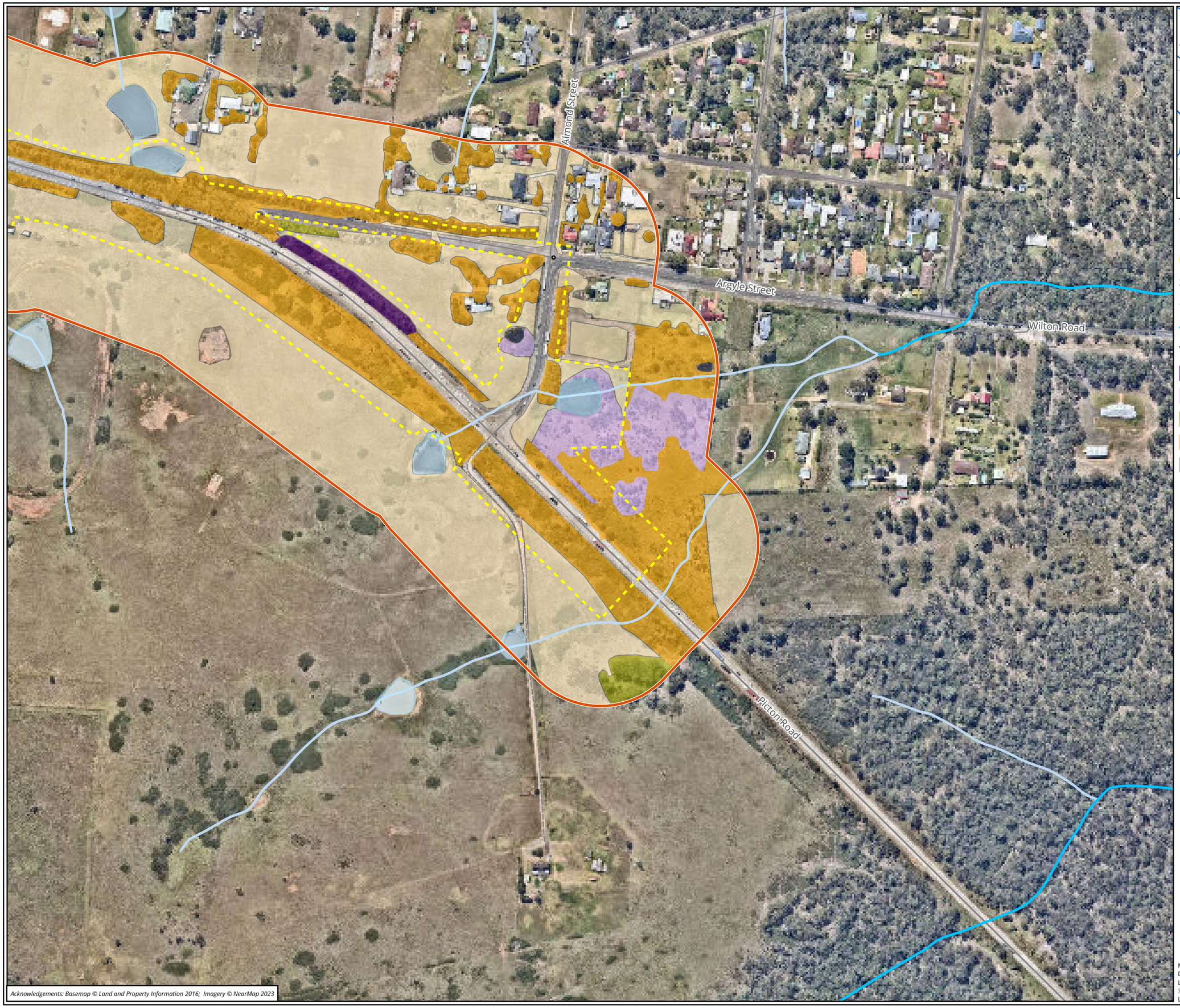

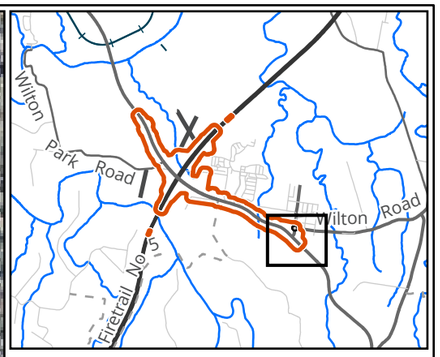

Legend

- Study area
- Proposal site

Strahler order

- 1
- 2

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 3_PCT849_DNS
- Zone 8_PCT1395_Low
- Urban Native/Exotic
- Non-offsettable grassland

Figure 3-1: Vegetation zones
Page 9

0 50 100 150
Meters
Scale: 1:4,000 @ A3
Coordinate System:
GDA2020 MGA Zone 56

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3.2.1 PCT 849: *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*

Description

Cumberland Shale Plains Woodland typically exists as an open grassy woodland dominated by Grey Box *Eucalyptus moluccana*, Forest Red Gum *Eucalyptus tereticornis* and Ironbarks such as Narrow-leaved Ironbark *Eucalyptus crebra* and Broad-leaved Ironbark *Eucalyptus fibrosa*. The lower strata is typified by a sparse to moderate cover of shrubs such as Blackthorn *Bursaria spinosa* and a high percentage of ground covers such as Kidney Weed *Dichondra repens* and Weeping Grass *Microlaena stipoides*.

This community exists within the study area in a moderate condition state and contains a canopy dominated by Forest Red Gum and Narrow-leaved Ironbark supported by sporadic occurrences of native midstorey species such as Blackthorn. Native groundcover species consisted of Weeping Grass, Kangaroo Grass *Themeda triandra*, Threeawn Speargass *Aristida vagans*, Hairy Panic *Panicum effusum*, Browns Lovegrass *Eragrostis brownii*, *Dichondra repens* Kidney Weed, Blue Pincushion *Brunonia australis*, Berry Saltbush *Einadia hastata*, Native Wandering Jew *Commelina cyanea*, Yellow Autumn-lily *Tricoryne elatior* and Swamp Dock *Rumex brownii*. Exotic weed species were also present and consisted predominantly of St Johns Wort *Hypericum perforatum,* Rhodes Grass *Chloris gayana,* African Olive *Olea europaea* subsp*. cuspidata,* Fireweed *Senecio madagascariensis* and Blackberry *Rubus fruticosus.*

With respect to vegetation existing as scattered trees, these areas were completely devoid of a native midstorey and groundcover, with the lower strata being dominated by exotic grasses and herbs. Dominant exotic species within these areas included African Lovegrass *Eragrostis curvula,* Kikuyu *Cenchrus clandestinus,* Paspalum *Paspalum dilatatum,* Rattail Grass *Sporobolus africanus,* and Pigeon Grass *Setaria parviflora*.

Derived Native Grassland (DNG) within the study area contained a significantly high abundance of Kangaroo Grass supported by other native groundcover species such as Slender Tick-trefoil *Desmodium varians,* Common Woodruff *Asperula conferta,* Kidney Weed, Knob Sedge *Carex inversa* and Variable Glycine *Glycine tabacina.* The Derived Native Shrubland (DNS) condition type was similar to this, however a midstorey of Blackthorn and Parramatta Wattle was additionally present. Weed species recorded in these patches consisted primarily of Rhodes Grass, Purpletop *Verbena bonariensis,* Paspalum*,* Fleabane *Conyza bonariensis* and Blackberry.

The conservation status and survey effort within PCT 849 is provided in Table 3-3.

Table 3-3: PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion

PCT ID	849
PCT name	*Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*
Vegetation class	Coastal Valley Grassy Woodlands
Vegetation formation	Grassy Woodlands
Conservation status	**NSW BC Act:** All condition state patches were determined to meet the criteria for *Cumberland Plain Woodland in the Sydney Basin Bioregion* (CEEC). **Commonwealth EPBC Act:** Moderate condition states meet the condition thresholds outlined in the Listing Advice for the EPBC Act listed CEEC *Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest* (TSSC 2009). Patches in a Scattered trees condition state did not meet condition thresholds outlined in the Listing Advice for the EPBC Act listed community (TSSC 2009) as it did not support a native perennial understorey of more than 30%. For this reason, DNS and DNG condition states are also not included as part of the Commonwealth listed ecological community. State and Commonwealth TECs are mapped on Figure 3-2.
Vegetation zones (condition) and plots	The following BAM plots were completed for this vegetation type: • *Zone 1_Moderate condition (Photo 3-1)– Four plots*

	– PR_NGH_71 – PR_NGH_89 – PR_NGH_106 – PR_BAM_02 • *Zone 2_Scattered Trees (Photo 3-2)– One plot* – PR_BAM_03 • *Zone 3_DNG (Photo 3-3)– One plot* – PR_NGH_72 • *Zone 4_DNS (Photo 3-4)– One plot* – PR_BAM-06

Justification for PCT selection:

PCT 849 within the proposal site meets the PCT description via the following:

- Soil – occurs on the Blacktown soil landscape close to intergrades with the Lucas Heights and Luddenham Park soil landscapes.
- Structure – open forest with occasional mid-storey and understorey varying between dense shrubs or low sparse shrub cover with an abundant cover of grasses.
- Dominant species – canopy dominated by Forest Red Gum with a mid-storey of Blackthorn and Parramatta Wattle over groundcover containing a mix of grasses, sedges and forbs.
- IBRA region and subregion – Sydney Basin region and Cumberland subregion.

The floristic and structural summary of PCT 849 is provided in Table 3-4

Table 3-4: Floristic and structural summary of PCT 849 within the study area

Growth form	Dominant species	
	Common name	Species name
Trees	Forest Red Gum Narrow-leaved Ironbark Grey Box	*Eucalyptus tereticornis* *Eucalyptus crebra* *Eucalyptus moluccana*
Shrubs	Blackthorn Parramatta Wattle	*Bursaria spinosa* *Acacia parramattensis*
Grass and grass-like	Weeping Grass Threeawn Speargrass Kangaroo Grass Hairy Panic	*Microlaena stipoides* *Aristida vagans* *Themeda triandra* *Panicum effusum*
Forbs and herbs	Native Wandering Jew Berry Saltbush Kidney Weed Yellow-autumn Lily	*Commelina cyanea* *Einadia hastata* *Dichondra repens* *Tricoryne elatior*

Photo 3-1: PCT 849 Moderate

Photo 3-2: PCT 849 Scattered Trees

Photo 3-3: PCT 849 DNG

Photo 3-4: PCT 849 DNS

3.2.2 PCT 1181: *Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion*

Description

This community typically exists as an open eucalypt forest on sandstone gullies and is generally dominated by Sydney Red Gum *Angophora costata,* Red Bloodwood *Corymbia gummifera,* Blackbutt *Eucalyptus pilularis* and Sydney Peppermint *Eucalyptus piperita.* The lower strata is supported by a variety of shrubs and sedges.

This community was present in a high condition state within the study area and contains a canopy of Grey Gum *Eucalyptus punctata,* Narrow-leaved Apple *Angophora bakeri* and Thin-leaved Stringybark *Eucalyptus eugenioides.* The lower strata was supported by a midstorey of Black She-oak *Allocasuarina littoralis,* Tick Bush *Kunzea ambigua,* Prickly Moses *Acacia ulicifolia,* Narrow-leaved Geebung *Persoonia linearis* and Sticky Wallaby Bush *Beyeria viscosa.* The groundcover consisted of species such as Narrow-leaved Boronia *Boronia anethifolia,* Sword Sedge *Lepidosperma laterale,* Wiry Panic *Entolasia stricta,* Sheath Rush *Cyathochaeta diandra,* Two-coloured Panic *Panicum simile,* Many-flowered Mat-rush *Lomandra multiflora,* Pomax *Pomax 86mbellate,* Slender Wire Lily *Laxmannia gracilis* and Ivy Goodenia *Goodenia hederacea.*

The conservation status and survey effort within PCT 1181 is provided in Table 3-5.

Table 3-5: PCT 1181: Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion

PCT ID	1181
PCT name	*Smooth-barked Apple – Red Bloodwood – Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion*
Vegetation class	Sydney Coastal Dry Sclerophyll Forests
Vegetation formation	Dry Sclerophyll Forests
Conservation status	**N/A – This PCT is not associated with any known NSW or Commonwealth listed TECs**
Vegetation zones (condition) and plots	The following BAM plots were completed for this vegetation type: • *Zone 5_High condition (Photo 3-5) – One plot* – PR_NGH_82

Justification for PCT selection:

PCT 1181 within the proposal site meets the PCT description via the following:

- Soil - occurs on the Blacktown soil landscape close to intergrades with the Lucas Heights and Luddenham Park soil landscapes.
- Landscape position – occurs in a dry sandstone gully in the IBRA region and subregion – Sydney Basin region and Cumberland subregion.
- Structure – open eucalypt forest with abundant sclerophyll shrubs over sedges.
- IBRA region and subregion – Sydney Basin region and Cumberland subregion.

The floristic and structural summary of PCT 849 is provided in Table 3-6.

Table 3-6: Floristic and structural summary of PCT 1181 within the study area

Growth form	Dominant species	
	Common name	Species name
Trees	Sydney Red Gum Red Bloodwood Blackbutt Narrow-leaved Apple Grey Gum	*Angophora costata* *Corymbia gummifera* *Eucalyptus pilularis* *Angophora bakeri* *Eucalyptus punctata*
Shrubs	Black She-oak Tick Bush Narrow-leaved Geebung	*Allocasuarina littoralis* *Kunzea ambigua* *Persoonia linearis*
Grass and grass-like	Two-coloured Panic Sword Sedge Sheath Rush Wiry Panic	*Panicum simile* *Lepidosperma laterale* *Cyathochaeta diandra* *Entolasia stricta*
Forbs and herbs	Slender Wire Lily Ivy Goodenia Pomax	*Laxmannia gracilis* *Goodenia hederacea* *Pomax umbellata*

Photo 3-5: PCT 1181 High

3.2.3 PCT 1395: *Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*

Description

Cumberland shale – sandstone Ironbark forest generally occurs on the fringes of the Cumberland Plain and exists as a moderately tall eucalypt forest with a mixed understorey of sclerophyll shrubs and grasses. Dominant canopy species are typically Narrow-leaved Ironbark *Eucalyptus crebra,* Broad-leaved Ironbark *Eucalyptus fibrosa,* Grey Gum *Eucalyptus punctata* and Red Bloodwood *Corymbia gummifera.* Black She-oak *Allocasuarina littoralis* is common within the midstorey, as well as other Geebung *Persoonia* spp.

Vegetation existing in a high condition state contained an intact canopy and lower strata with weed species being mostly non-existent. Canopy species found included Grey Gum, Thin-leaved Stringybark *Eucalyptus eugenioides,* Narrow-leaved Ironbark, Broad-leaved Ironbark and Narrow-leaved Apple *Angophora bakeri.* The midstorey was supported by species such as Tick Bush *Kunzea ambigua,* White Wattle *Acacia linifolia,* Tantoon *Leptospermum polygalifolium,* Blackthorn *Bursaria spinosa,* Narrow-leaved Geebung *Persoonia linearis,* and She-oak *Allocasuarina littoralis.* The groundcover was found to consist of Native Fushia *Correa reflexa,* Wiry Panic *Entolasia stricta,* Sword Sedge *Lepidosperma laterale,* Rock Fern *Cheilanthes sieberi,* Two-coloured Panic *Panicum simile* and Weeping Grass *Microlaena stipoides.*

Moderate and low condition vegetation contained some of the above listed species, however species diversity was lower by comparison. In both of these condition states, the midstorey was found to be subject to edge effects as a result of the adjacent road corridor which has subsequently resulted in a lower species abundance. Low condition vegetation contained a higher abundance of exotic weed species, predominantly Fireweed *Senecio madagascariensis,* Pigeon Grass *Setaria parviflora,* Paddys Lucerne *Sida rhombifolia* and Panic Veldt grass *Ehrharta erecta.* Vegetation existing as scattered trees also contained a similar canopy/groundcover to that described above, however species diversity and abundance was significantly lower, and a midstorey was absent.

Derived native shrubland within the study area contained a significantly high abundance of shrubs such as Black She-oak, Tick Bush, Blackthorn and Parramatta Wattle. The groundcover was dominated by Weeping Grass and supported by other native groundcover species such as Variable Glycine *Glycine tabacina,* Pitted Bluegrass *Bothriochloa decipiens* var. *decipiens* and Common Woodruff. Weed species recorded in these patches consisted primarily of Blackberry *Rubus fruticosus,* Lambs Tongue *Plantago lanceolata,* African Lovegrass *Eragrostis curvula* and St Johns Wort *Hypericum perforatum.*

The conservation status and survey effort within PCT 1181 is provided in Table 3-7.

Table 3-7: PCT 1395: Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion

PCT ID	1395
PCT name	*Narrow-leaved Ironbark – Broad-leaved Ironbark – Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*
Vegetation class	Grassy Woodlands
Vegetation formation	Dry Sclerophyll Forests
Conservation status	**NSW BC Act:** All condition state patches were determined to meet the criteria for *Shale Sandstone Transition Forest in the Sydney Basin Bioregion* (CEEC). **Commonwealth EPBC Act:** High, moderate and low condition states meet the condition thresholds outlined in the Listing Advice for the EPBC Act listed CEEC Shale Sandstone Transition Forest of the Sydney Basin Bioregion (DoE 2014a). Scattered trees condition states did not meet condition thresholds outlined in the Listing Advice for the EPBC Act listed community (DoE 2014a) as it did not support a native perennial understorey of more than 30%. The listing advice also states that DNS condition states are also not included as part of the Commonwealth listed ecological community. State and Commonwealth TECs are mapped on Figure 3-2.
Vegetation zones (condition) and plots	The following BAM plots were completed for this vegetation type: • *Zone 6_High condition (Photo 3-6) – Three plots* – PR_NGH_80 – PR_NGH_81 – PR_BAM_01 • *Zone 7_Moderate condition (Photo 3-7) – Three plots* – PR_NGH_77 – PR_NGH_102 – PR_NGH_112

- *Zone 8_Low condition (Photo 3-8) – Three plots*
  - PR_NGH_70
  - PR_NGH_74
  - PR_NGH_75
- *Zone 9_Scattered Trees (Photo 3-9) – One plot*
  - PR_BAM_04
- *Zone 10_DNS (Photo 3-10) – One plot*
  - PR_BAM_05

Justification for PCT selection:

PCT 1395 within the proposal site meets the PCT description via the following:

- Soil – occurs on the Blacktown soil landscape close to intergrades with the Lucas Heights and Luddenham Park soil landscapes.
- Landscape position - The community was recorded on the fringes of the Cumberland Plain in the IBRA region and subregion – Sydney Basin region and Cumberland subregion.
- Structure – Situated on clay intergrade soils and is present as a moderately tall eucalypt forest with a mixed understorey of sclerophyll shrubs and grasses.
- IBRA region and subregion – Sydney Basin region and Cumberland subregion.

The floristic and structural summary of PCT 849 is provided in Table 3-8.

Table 3-8: Floristic and structural summary of PCT 1395 within the study area

Growth form	Dominant species	
	Common name	Species name
Trees	Red Bloodwood Grey Gum Narrow-leaved Ironbark Broad-leaved Ironbark Thin-leaved Stringybark	*Corymbia gummifera* *Eucalyptus punctata* *Eucalyptus crebra* *Eucalyptus fibrosa* *Eucalyptus eugenioides*
Shrubs	Black She-oak Tick Bush Narrow-leaved Geebung White Wattle Tantoon Blackthorn	*Allocasuarina littoralis* *Kunzea ambigua* *Persoonia linearis* *Acacia linifolia* *Leptospermum polygalifolium* *Bursaria spinosa*
Grass and grass-like	Two-coloured Panic Sword Sedge Wiry Panic Browns Lovegrass	*Panicum simile* *Lepidosperma laterale* *Entolasia stricta* *Eragrostis brownii*
Forbs and herbs	Native Fushia Blue Flax Lily Pomax Kidney Weed	*Correa reflexa* *Dianella revoluta* *Pomax umbellata* *Dichondra repens*
Ferns	Rock Fern	*Cheilanthes sieberi*

Photo 3-6: PCT 1395 High

Photo 3-7: PCT 1395 Moderate

Photo 3-8: PCT 1395 Low

Photo 3-9: PCT 1395 Scattered Trees

Photo 3-10: PCT 1395 DNS

3.2.4 PCT 877: *Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion*

Description

This community typically occurs on very sheltered clay-rich soils of the undulating hills and ranges of western Sydney and the southern Blue Mountains. Dominant species typically include Grey Myrtle *Backhousia myrtifolia* Port Jackson Fig *Ficus rubiginosa*, Wild Quince *Alectryon subcinereus* and Whalebone Tree *Streblus brunonianus*. The lower strata is also generally supported by a variety of shrubs, ferns and sedges.

Within the study area, this community was present in a high condition state and existed primarily as a monoculture of Grey Myrtle. This was supported by native groundcover species such as Sword Sedge *Lepidosperma laterale,* Wiry Panic *Entolasia stricta,* Weeping Grass *Microlaena stipoides,* Basket Grass *Oplismenus imbecillis,* Kidney Weed *Dichondra repens,* Maidenhair Fern *Adiantum aethiopicum,* Sickle Fern *Pellaea falcata* and Rock Fern *Cheilanthes sieberi.*

The conservation status and survey effort within PCT 1181 is provided in Table 3-9.

Table 3-9: PCT 877: Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion

PCT ID	877
PCT name	*Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion*
Vegetation class	Dry Rainforests
Vegetation formation	Rainforests
Conservation status	**Commonwealth EPBC Act and NSW BC Act**: Not listed. Whilst the species composition of this community is characteristic of the Western Sydney Dry Rainforest TEC, this community occurs on clay soils derived from Wianamatta shale. The dominance of sandstone within the study area inhibits the listing of this community under both the EPBC Act and BC Act.
Vegetation zones (condition) and plots	*Zone 13_High* (Photo 3-11)

	– No plots were completed within this zone. Benchmark data contained within the BAM-C used.

Justification for PCT selection:

PCT 877 within the proposal site meets the PCT description via the following:

- Structure – Sheltered rainforest community with a very sparse midstorey on the Cumberland plain. Occurs within a sandstone gully.
- Dominant species – Absent canopy with a midstorey dominated by Grey Myrtle over groundcover containing a mix of grasses, sedges and forbs.
- IBRA region and subregion – Sydney Basin region and Cumberland subregion.

The floristic and structural summary of PCT 849 is provided in Table 3-10.

Table 3-10: Floristic and structural summary of PCT 877 within the study area

Growth form	Dominant species	
	Common name	Species name
Shrubs	Grey Myrtle	*Backhousia myrtifolia*
Grass and grass-like	Sword Sedge Wiry Panic Weeping Grass Basket Grass	*Lepidosperma laterale* *Entolasia stricta* *Microlaena stipoides* *Oplismenus imbecillis*
Forbs and herbs	Kidney Weed	*Dichondra repens*
Ferns	Rock Fern Maidenhair Fern Sickle Fern	*Cheilanthes sieberi* *Adiantum aethiopicum* *Pellaea falcata*

Photo 3-11: PCT 877 High

3.3 Threatened ecological communities

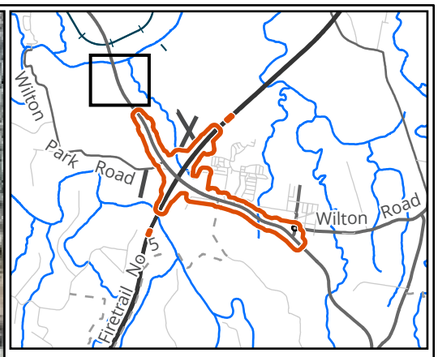
Vegetation within the study area was found to represent two TECs listed under the NSW BC Act and the Commonwealth EPBC Act, as outlined in Table 3-11 and Table 3-12, and illustrated on Figure 3-2. TEC justifications are included within the PCT descriptions in the sections above for the relevant PCTs.

Table 3-11: Summary of BC Act TECs within the study area

BC Act TEC	Associated PCTs	Listing status	Study area (ha)	Proposal site (ha)
Cumberland Plain Woodland in the Sydney Basin Bioregion	*PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	CEEC	14.36	5.76
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	PCT 1395: *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*	CEEC	19.97	7.33

Table 3-12: Summary of EPBC Act TECs within the study area

EPBC Act TEC	Associated PCTs	Listing status	Study area (ha)	Proposal site (ha)
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	*PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	CEEC	14.36	4.01
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	PCT 1395: *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*	CEEC	19.97	6.59



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Biodiversity survey area outside of study area

Vegetation zone (within previous proposal site)

- Zone 5_PCT1181_High
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 12_PCT1395_DNG

Threatened ecological communities (BC Act)

Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 1

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Coordinate System: GDA2020 MGA Zone 56

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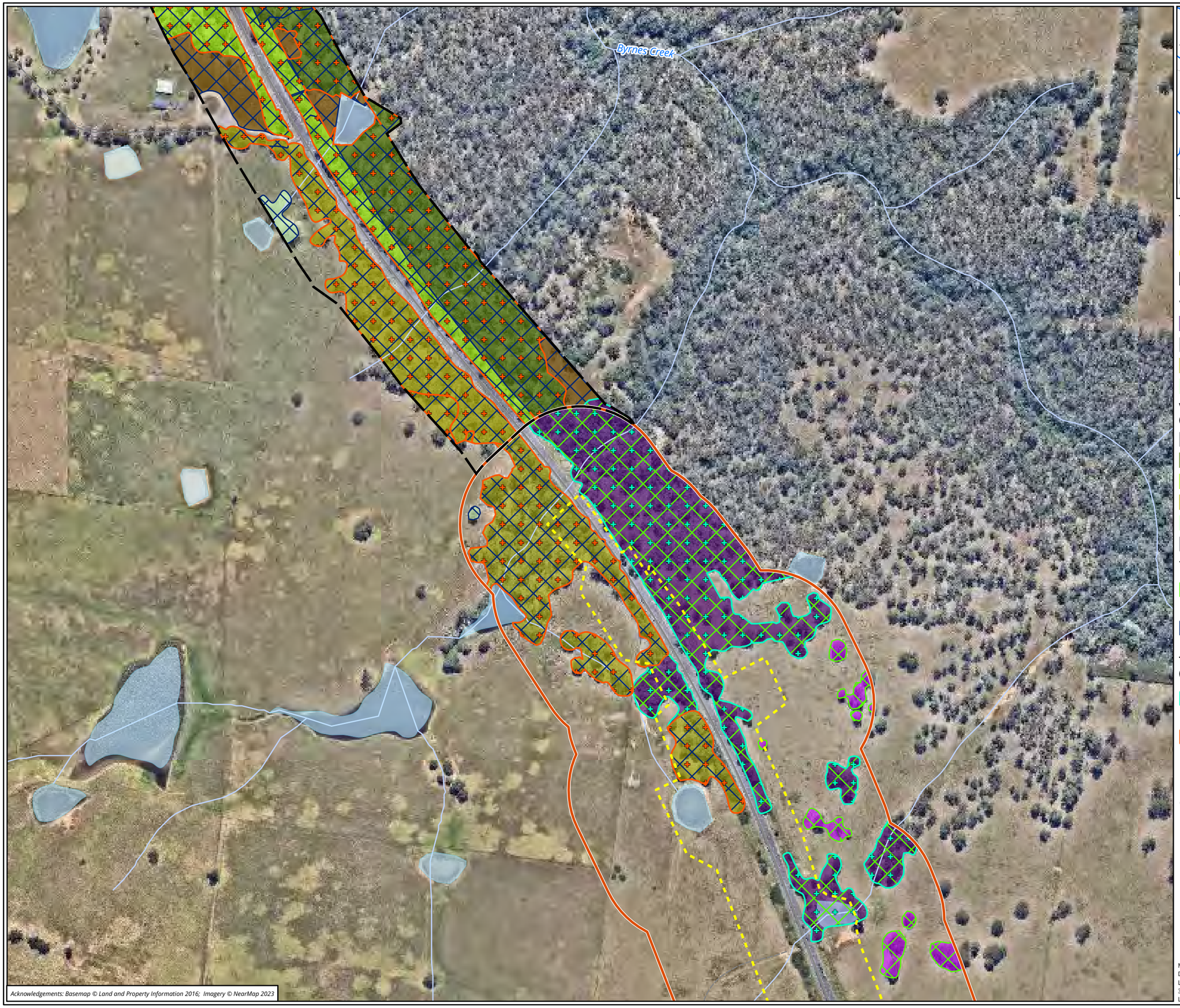

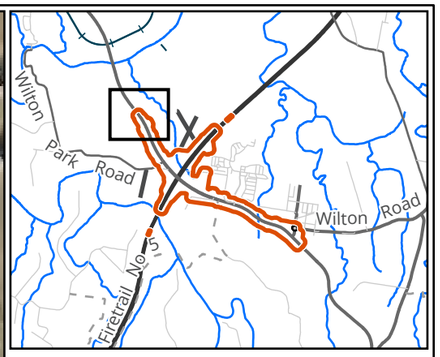

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 12_PCT1395_DNG

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 2

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Meters

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Coordinate System: GDA2020 MGA Zone 56

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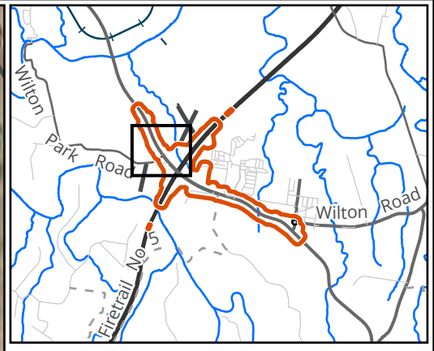

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 3_PCT849_DNS
- Zone 4_PCT849_DNG
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 3

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Meters

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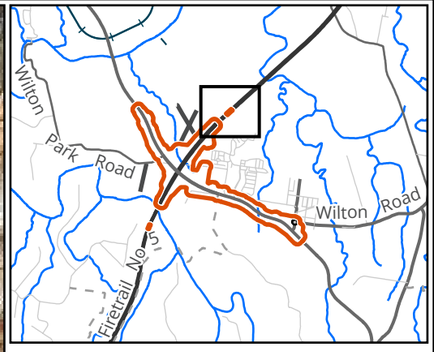

Legend

- Study area
- Proposal site

Vegetation zone

- Zone 1_PCT849_Moderate

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)

Figure 3-2: Threatened ecological communities
Page 4

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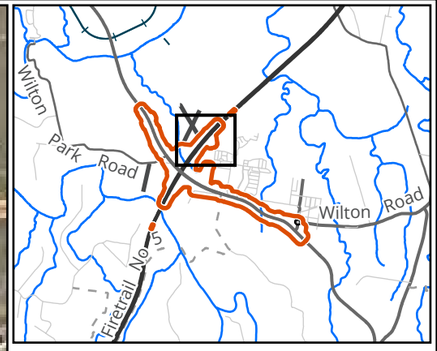

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 5

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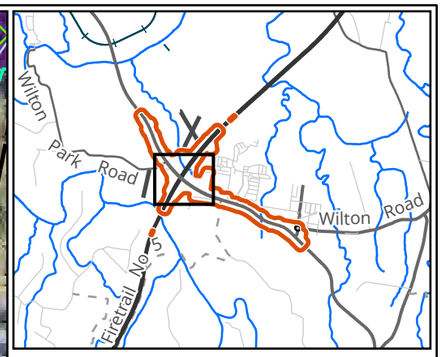

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 3_PCT849_DNS
- Zone 4_PCT849_DNG
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 10_PCT1395_DNS
- Zone 11_PCT877_High

Vegetation zone (within previous proposal site)

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 6

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Meters

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Coordinate System: GDA2020 MGA Zone 56

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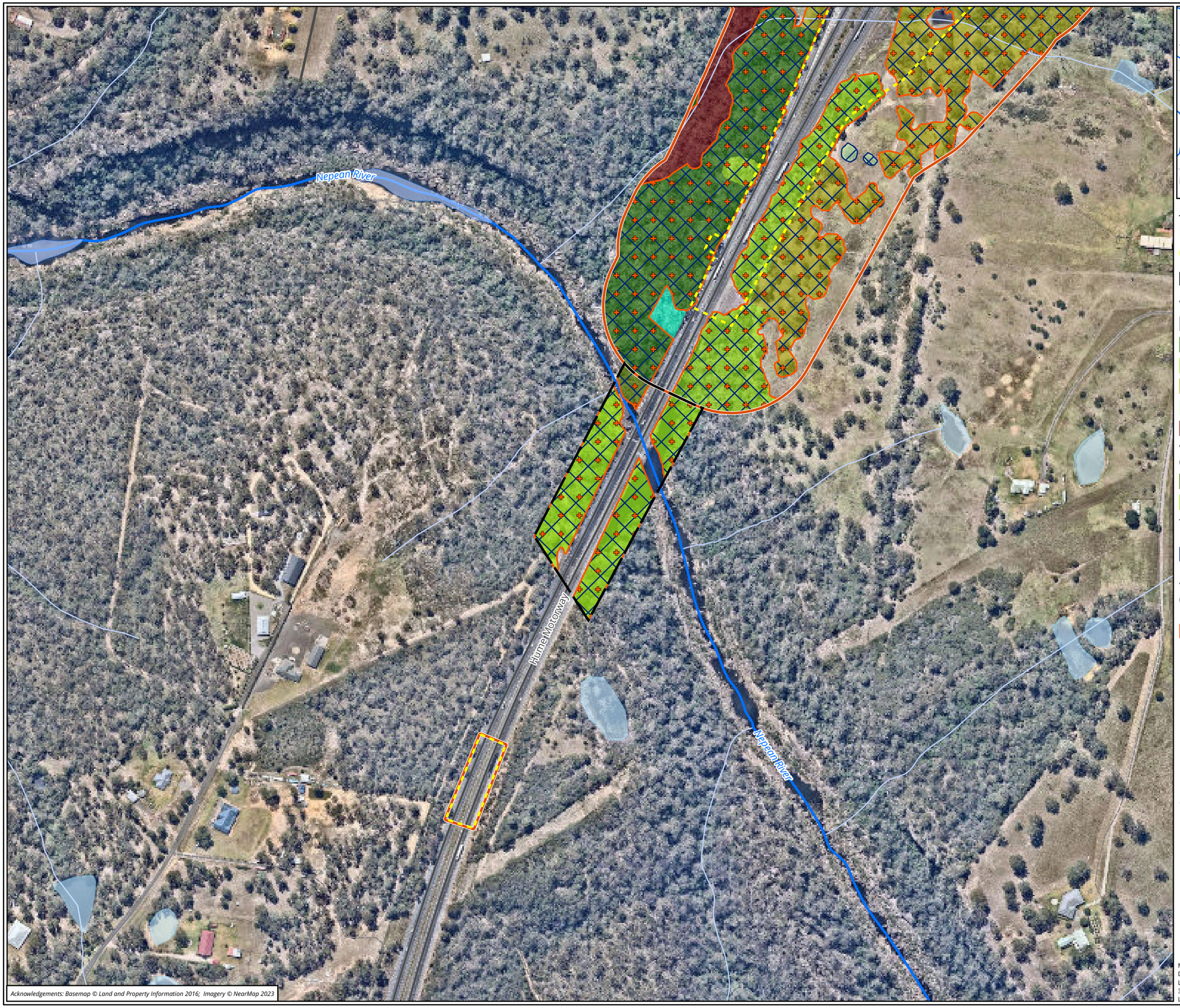

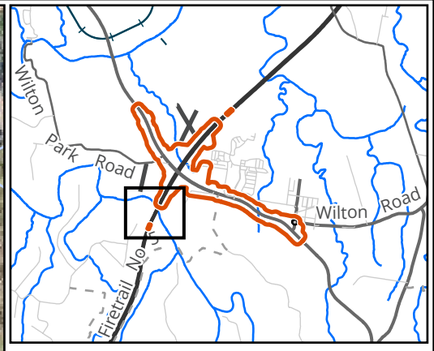

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 5_PCT1181_High
- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate
- Zone 8_PCT1395_Low
- Zone 9_PCT1395_Scattered Trees
- Zone 11_PCT877_High

Vegetation zone (within previous proposal site)

- Zone 6_PCT1395_High
- Zone 7_PCT1395_Moderate

Threatened ecological communities (BC Act)

- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 7

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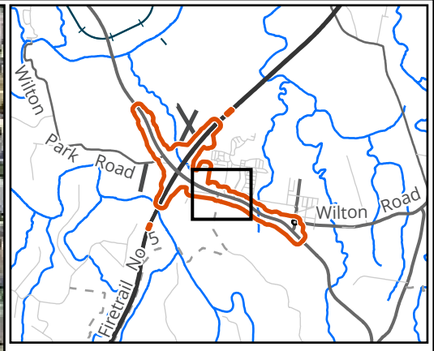

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 3_PCT849_DNS

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)

Figure 3-2: Threatened ecological communities
Page 8

0 50 100 150

Meters

Scale: 1:4,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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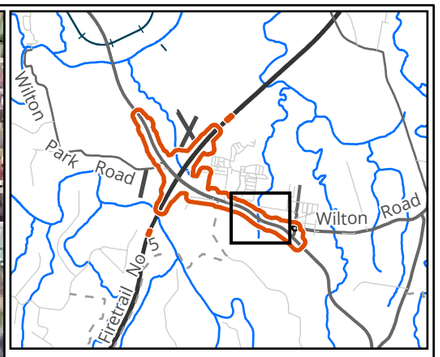

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 2_PCT849_Scattered Trees
- Zone 8_PCT1395_Low

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 9

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Meters
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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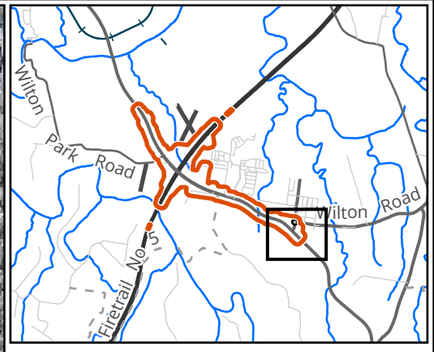

Legend

- Study area
- Proposal site
- Biodiversity survey area outside of study area

Vegetation zone

- Zone 1_PCT849_Moderate
- Zone 3_PCT849_DNS
- Zone 8_PCT1395_Low

Vegetation zone (within previous proposal site)

- Zone 6_PCT1395_High
- Zone 8_PCT1395_Low

Threatened ecological communities (BC Act)

- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Figure 3-2: Threatened ecological communities
Page 10

0 50 100 150
Meters
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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3.4 Exotic flora species

A total of 11 exotic flora species were identified within the proposal site, of which five are listed as Priority Weeds for the Greater Sydney region under the *Biosecurity Act 2015*. Nine of these species are also considered to be high threat weeds under the BAM (DPIE 2020a). Six of these species are also included on the Commonwealth list of Weeds of National Significance (WoNS) (see Table 3-13).

A summary of the exotic species recorded within the study area is provided below.

Table 3-13 Summary of exotic flora within the study area

Species name	Common Name	Priority Weed	High Threat Weed	WoNS
Ageratina adenophora	Crofton Weed		X	
Asparagus aethiopicus	Asparagus Fern	X	X	X
Asparagus asparagoides	Bridal Creeper	X	X	X
Chloris gayana	Rhodes Grass		X	
Lantana camara	Lantana		X	X
Lycium ferocissimum	African Boxthorn	X	X	X
Olea europaea subsp. *cuspidata*	African Olive	X	X	
Rubus fruticosus	Blackberry	X	X	X
Senecio madagascariensis	Fireweed		X	X
Sida rhombifolia	Paddy's Lucerne			
Sonchus oleraceus	Common Sowthistle			

Five priority weeds for the Greater Sydney LLS region have been recorded in the study area, and are listed above.

The Biosecurity Act provides for the identification, classification and control of priority weeds with the purpose of determining if a biosecurity risk is likely to occur. A priority weed is any weed identified in a local strategic plan, for a region that includes that land or area, as a weed that is or should be prevented, managed, controlled or eradicated in the region.

The General Biosecurity Duty as outlined in the Biosecurity Act states:

All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

To prevent biosecurity impacts from occurring as a result of the presence of the above listed priority weeds within the study area, all practical steps should be taken to control and eradicated the weeds from the study area as per the relevant biosecurity duties outlined above, or prior to or during any future vegetation removal.

3.5 Groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are defined by the NSW Department of Primary Industries (DPI) Water as *ecosystems that require access to groundwater to meet all or some of their water requirements 'so as to maintain their*

communities of plants and animals, ecological processes and ecosystem services' (OEH & DPI Fisheries 2020). To assist with the identification and mapping of these ecosystems, DPI Water has published the guidance document, *Methods for the identification of high probability groundwater dependent vegetation ecosystems* (Kuginis et al. 2016). The following background section is taken from the literature review included in Kuginis et al. (2016).

3.5.1 Background

Plant species within a community may exhibit differing degrees of groundwater dependency and can range from obligate (total/entire) to facultative (partial and infrequent (i.e. seasonal/episodic). Vegetation will extract water from sources that require the least amount of energy. This means that vegetation will use shallow soil water first before seeking deeper soil water or groundwater. Where there is insufficient soil water for plant physiological requirements, plants will become increasingly dependent on available groundwater as soil water is depleted (Kuginis et al. 2016).

The decision rules used in the identification of potential GDEs are based on a fundamental tenet of ecology in '*that ecosystems will generally use resources in proportion to their availability and the availability of different resources will be a significant determinant of structure and composition*'. It is assumed that if an ecosystem can access groundwater, then that ecosystem will (generally) develop some degree of dependence and that dependence will likely increase with increasing aridity (Kuginis et al. 2016).

Key factors in the determination of identification of potential GDEs therefore include:

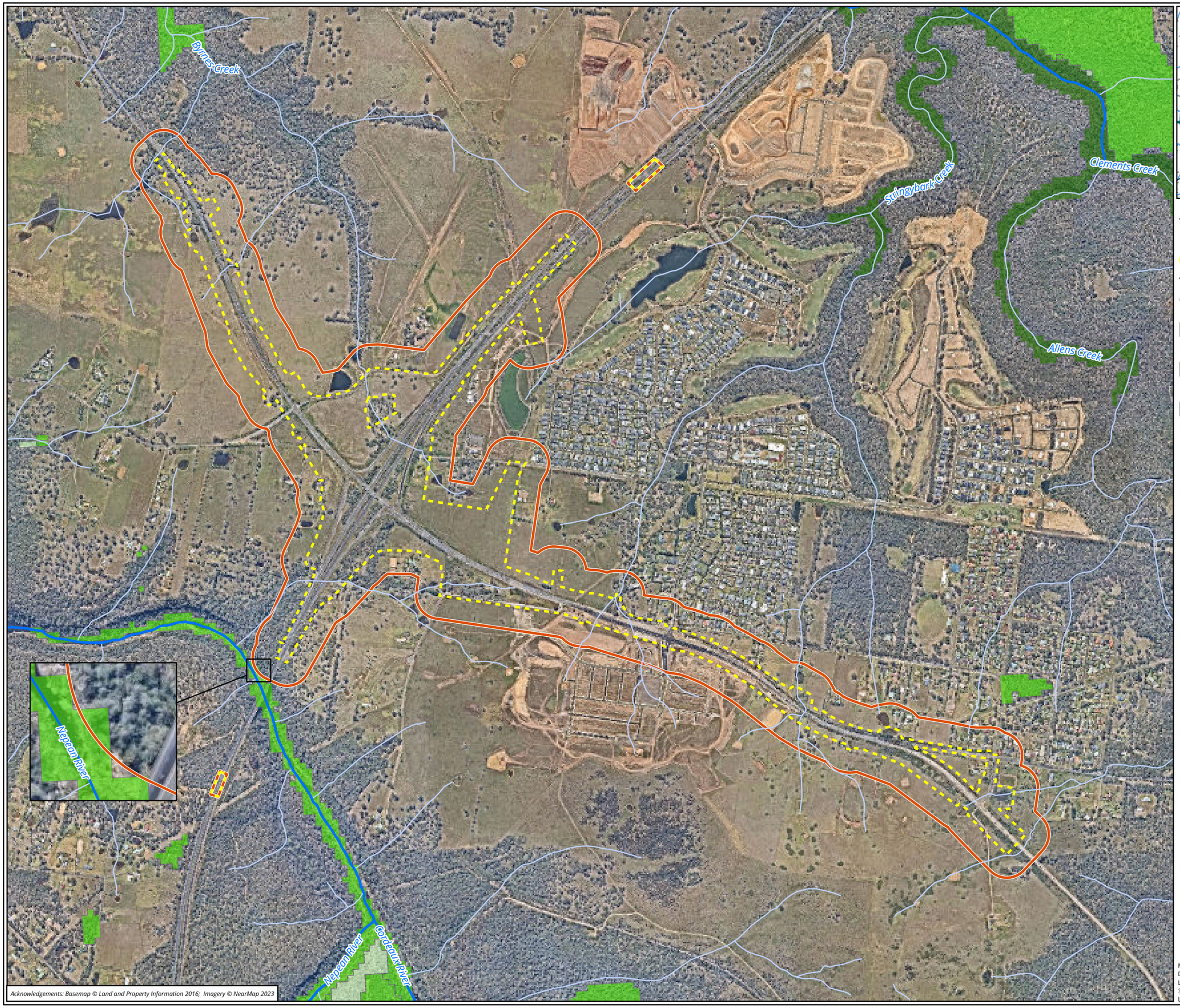
- proximity to groundwater
- root system distribution and depth
- location or position in the landscape
- species traits.

3.5.2 GDEs within the study area

The likely degree of groundwater dependence of the PCTs within the study area has been assessed using the Atlas of GDEs (BOM 2023). The Atlas of GDEs identifies areas of native vegetation within the study area that are modelled to contain moderate and high potential GDEs (see Figure 3-3).

Only moderate potential GDEs occur within study area, limited to a small area surrounding the riparian corridor of the Nepean River, which is on the boundary of the study area in the south, where PCT 1395 occurs. It should be mentioned that areas of modelled GDEs only occur within the study area and do not occur within the proposal site (GDE located about 80 metres to the south of the proposal site at its closest point).

While PCT 1395 is considered to have a high to moderate likelihood of being a GDE at the locations shown on Figure 3-3, this PCT is not obligate and entirely dependent on groundwater. PCT 1395 is not restricted to locations of groundwater discharge or located within aquifers. PCT 1395 is likely to be on opportunistic facultative GDE that depends on the subsurface presence of groundwater in some locations but not in others, particularly where an alternative source of water (i.e. rainfall) cannot be accessed to maintain ecological function (Kuginis et al. 2016).



Legend

- Study area
- Proposal site

Terrestrial groundwater dependent ecosystem

- High potential GDE - from national assessment
- Moderate potential GDE - from national assessment
- Low potential GDE - from national assessment

Figure 3-3: Groundwater dependent ecosystems

0 500

Meters

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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3.6 Threatened fauna species

Table 3-15 provides details of threatened fauna species detected within the study area, or assumed present due to the survey period being missed for certain areas. The table also outlines the attributes that comprise the threatened species polygons for each species. The threatened species habitat existing within the proposal site is illustrated through species polygons on Figure 3-4.

3.6.1 Hollow bearing trees

During field investigations, 20 hollow-bearing trees containing numerous hollows of varying size were identified within the study area. Of these hollow-bearing trees, 13 occur within the proposal site (Table 3-14).

Table 3-14: Hollow bearing trees recorded within the proposal site

PCT	Vegetation zone	Number of hollows
PCT 849 Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate	5
PCT 1395 Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Moderate	3
	Low	3
	Scattered Trees	2

3.6.2 Hollow dependent fauna

The Masked Owl was recorded during surveys and is considered likely to occur within the study area as part of larger foraging ranges. The study area is considered to provide suitable foraging habitat for the species, however no breeding/roosting habitat for these species was detected during survey. Targeted survey included searches of hollows suitable for use by Masked Owl as well as searches for signs of roosting Owls such as presence of pellets, whitewash and prey remains.

3.6.3 Megabats

The Grey-headed Flying-fox was recorded during surveys and were considered likely to occur within the study area as part of larger foraging ranges. The study area is considered to provide suitable foraging habitat for this species, however no breeding/roosting habitat (I.e. camps) was detected during survey which included searches up to 100 metres from the edge of the proposal site for Grey-headed Flying-fox camps.

3.6.4 Microbats

Inspection of the Pheasants Nest bridge, located in the south of the study area was undertaken during winter (August 2022). Visual inspection was undertaken on the North side of the Nepean River and revealed at least three individual bats roosting in a scupper hole of the bridge. The scupper hole was located within 10 metres of the vertical drop-off of the Nepean River gorge, to the north-western edge of the bridge. Additional bats were considered likely to be present in a scupper hole further back from the edge of the gorge due to the presence of a significant amount of fresh guano and staining around the hole. However, this location is fenced and could not be accessed during inspection. The visual inspection was accompanied by a 'stag watch', comprising active acoustic detector recording from below the bridge during the sunset period (30 minutes prior to sunset and 1 hour following sunset) which aimed to determine the species of bats emerging from roosts within the bridge.

The acoustic recordings taken resulted in poor quality call sequences due to interference from the amount of noise generated by traffic on the bridge and echo's resulting from bat calls bouncing off of the smooth hard surfaces of the bridge structure. However, during between 7:50pm and 8:30pm linear calls were recorded while the detector was aimed towards the location of the known roosting bats. Bats which produce linear calls and occur within the study area include Southern Myotis *Myotis macropus* and species belonging to the genus *Nyctophilus* (Long-eared bats). Generally, as these calls may or may not contain defining features, the linear bat calls cannot be definitively separated between the two genus'. Occasionally, clear long sequences of linear calls may contain qualities characteristic of Southern Myotis (central kink around 47kHz, louder projection

and longer sequence) and the species can be distinguished with some degree of confidence. The calls recorded at the bridge could not be identified to genus with any confidence. However, visual observations noted the bats roosting within the bridge did not have long ears and would not comprise species of the genus *Nyctophilus*. It is therefore considered likely that the species observed roosting in the bridge comprised individuals of Southern Myotis.

Further, acoustic recordings of bat calls during the sunset 'stag watch' period did not contain characteristics which could be attributed to other species of potential bridge-roosting bats such as Little Bent-winged Bat and Large Bent-winged Bat. Calls characteristic of the threatened Large-eared Pied Bat *Chalinolobus dwyeri* were recorded, however, these calls were faint and did not correlate with visual observations during the stag watch period. Nonetheless, as calls were observed, the species was assumed present.

Repeat survey conducted in November did not detect bats roosting in the accessible scupper holes of the bridge, and no bats were seen exiting the fenced area. In addition, directional microphones on acoustic bat detectors indicated the majority of calls recorded were coming from the direction of the Nepean River Gorge. A number of calls were recorded from the adjacent bushland to the west of the bridge, and these were attributed to species typically known to roost in tree hollows such as Gould's Wattled Bat *Chalinolobus gouldii*.

3.7 Threatened flora species

Table 3-15 provides details of threatened flora species detected within the study area, or assumed present due to the survey period being missed for certain areas. The table also outlines the attributes that comprise the threatened species polygons for each species. The threatened species habitat found or assumed within the proposal site is illustrated through species polygons on Figure 3 4.

No threatened flora species were recorded within the study area during targeted surveys. However, targeted surveys were unable to be completed within Lot 7 in DP 1280088 and Lots 16 and 18 in DP251051 within the study area, therefore presence has been assumed for five threatened flora species within suitable habitat these lots:

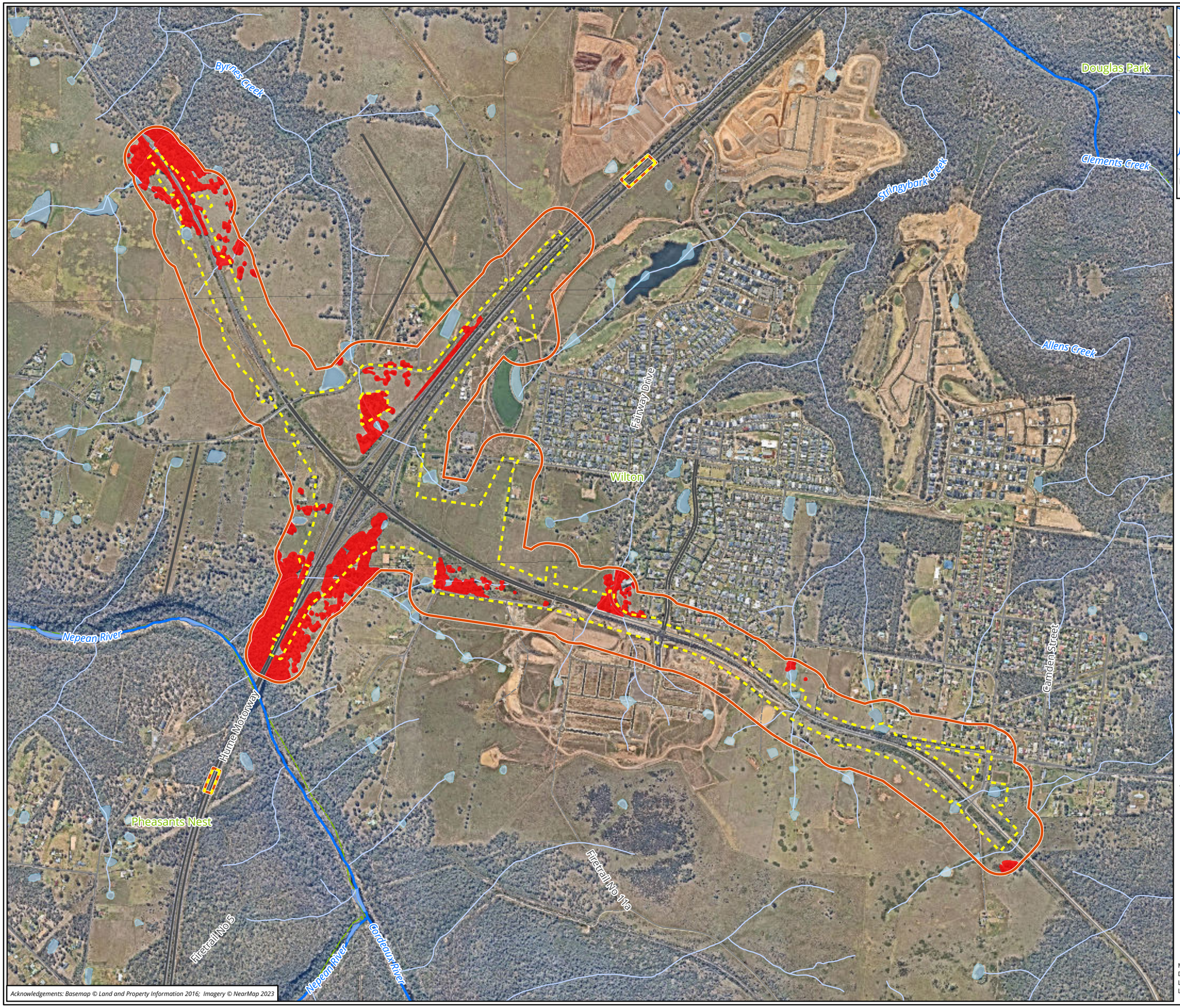
- Thick Lip Spider Orchid *Caladenia tessellata* (Endangered BC Act and Vulnerable EPBC Act)
- Sydney Plains Greenhood *Pterostylis saxicola* (Endangered BC Act and EPBC Act)
- Matted Bush-Pea *Pultenaea pedunculata* (Endangered BC Act)
- *Hibbertia puberula* (Endangered BC Act)
- Austral Pillwort *Pilularia novae-hollandiae* (Endangered BC Act).

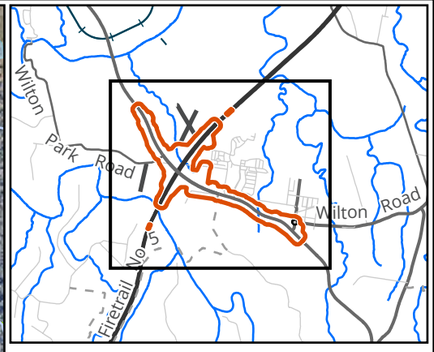
Table 3-15: Threatened species surveys results

Common name	Species name	EPBC Act	BC Act	Identification method (not assumed, recorded, expert report)	Survey effort compliant?[1]	Results	Polygon attributes
Fauna							
Koala	*Phascolarctos cinereus*	EN	EN	Recorded	Yes	Presence recorded within the study area Species polygon provided.	All vegetation zones that are continuous to suitable habitat. (Areas of suitable habitat that are discontinuous and where signs of Koala were not recorded, are not included in the Koala species polygon)
Little Bent-winged Bat	*Miniopterus australis*	-	VU	Recorded	Yes	Presence recorded within the study area. Foraging habitat only.	N/A - Species polygon only required for impacts to breeding habitat (OEH 2018))
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	VU	VU	Probable Record (chewed cones).	Yes	No records of individuals in the breeding season, no nesting identified.	N/A – Whilst chewed cones were found, this only indicates a probable sighting which cannot be confirmed.
Masked Owl	*Tyto novaehollandiae*	-	VU	Recorded	Yes	Observed within study area. No suitable breeding habitat within the study area.	N/A – No impact
Little Lorikeet	*Glossopsitta pusilla*	-	VU	Recorded	Yes	Presence recorded within the study area	N/A – Ecosystem species
Large-eared Pied Bat	*Chalinolobus dwyeri*	VU	VU	Recorded (probable acoustic calls)	Yes	Presence recorded within the study area. Foraging habitat only. Species polygon provided.	All habitat on the subject land where the subject land is within 2km of caves, scarps, cliffs, rock overhangs and disused mines. (All vegetation within the proposal site is located within 2km of these features)

Common name	Species name	EPBC Act	BC Act	Identification method (not assumed, recorded, expert report)	Survey effort compliant?[1]	Results	Polygon attributes
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	-	VU	Recorded (species group acoustic calls)	Yes	Presence recorded within the study area. Foraging habitat only. .	N/A – Ecosystem species
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	-	VU	Recorded	Yes	Presence recorded within the study area. Foraging habitat only. .	N/A – Ecosystem species
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	-	VU	Recorded	Yes	Presence recorded within the study area. Foraging habitat only. .	N/A – Ecosystem species
Large Bent-winged Bat	*Miniopterus orianae oceanensis*	-	VU	Recorded (species group acoustic calls)	Yes	Presence recorded within the study area. Foraging habitat only.	N/A (Species polygon only required for impacts to breeding habitat (OEH 2018))
Southern Myotis	*Myotis macropus*	-	VU	Recorded (species group calls)	Yes	Presence recorded within the study area. Species polygon provided.	All habitat that is within 200m of a waterbody with pools/ stretches 3m or wider. (See Figure 3-4 for buffers used)
Greater Broad-nosed Bat	*Scoteanax rueppellii*	-	VU	Recorded (species group acoustic calls)	Yes	Presence recorded within the study area. Foraging habitat only..	N/A – Ecosystem species
Grey-headed Flying-fox	*Pteropus poliocephalus*	VU	VU	Recorded	Yes	Presence recorded within the study area. Foraging habitat only..	N/A – Ecosystem species
Flora							
Thick Lip Spider Orchid	*Caladenia tessellata*	VU	EN	Assumed present	No	Assumed present. Species polygon provided	Areas of habitat not subject to suitable targeted survey, which includes:

Common name	Species name	EPBC Act	BC Act	Identification method (not assumed, recorded, expert report)	Survey effort compliant?[1]	Results	Polygon attributes
							• Lot 7 in DP 1280088 • Lot 16 in DP251051 • Lot 18 in DP251051
-	*Hibbertia puberula*		EN	Assumed present	No	Assumed present. Species polygon provided	Areas of habitat not subject to suitable targeted survey, which includes: • Lot 16 in DP251051 • Lot 18 in DP251051
Austral Pillwort	*Pilularia novae-hollandiae*		EN	Assumed present	No	Assumed present. Species polygon provided	Areas of habitat not subject to suitable targeted survey, which includes: • Lot 16 in DP251051 • Lot 18 in DP251051
Sydney Plains Greenhood	*Pterostylis saxicola*	EN	EN	Assumed present	No	Assumed present. Species polygon provided	Areas of habitat not subject to suitable targeted survey, which includes: • Lot 7 in DP 1280088 • Lot 16 in DP251051 • Lot 18 in DP251051
Matted Bush-Pea	*Pultenaea pedunculata*		EN	Assumed present	No	Assumed present. Species polygon provided	Areas of habitat not subject to suitable targeted survey, which includes: • Lot 7 in DP 1280088 • Lot 16 in DP251051 • Lot 18 in DP251051





Legend

- Study area
- Proposal site

Threatened species polygon (breeding habitat)

- Koala - *Phascolarctos cinereus*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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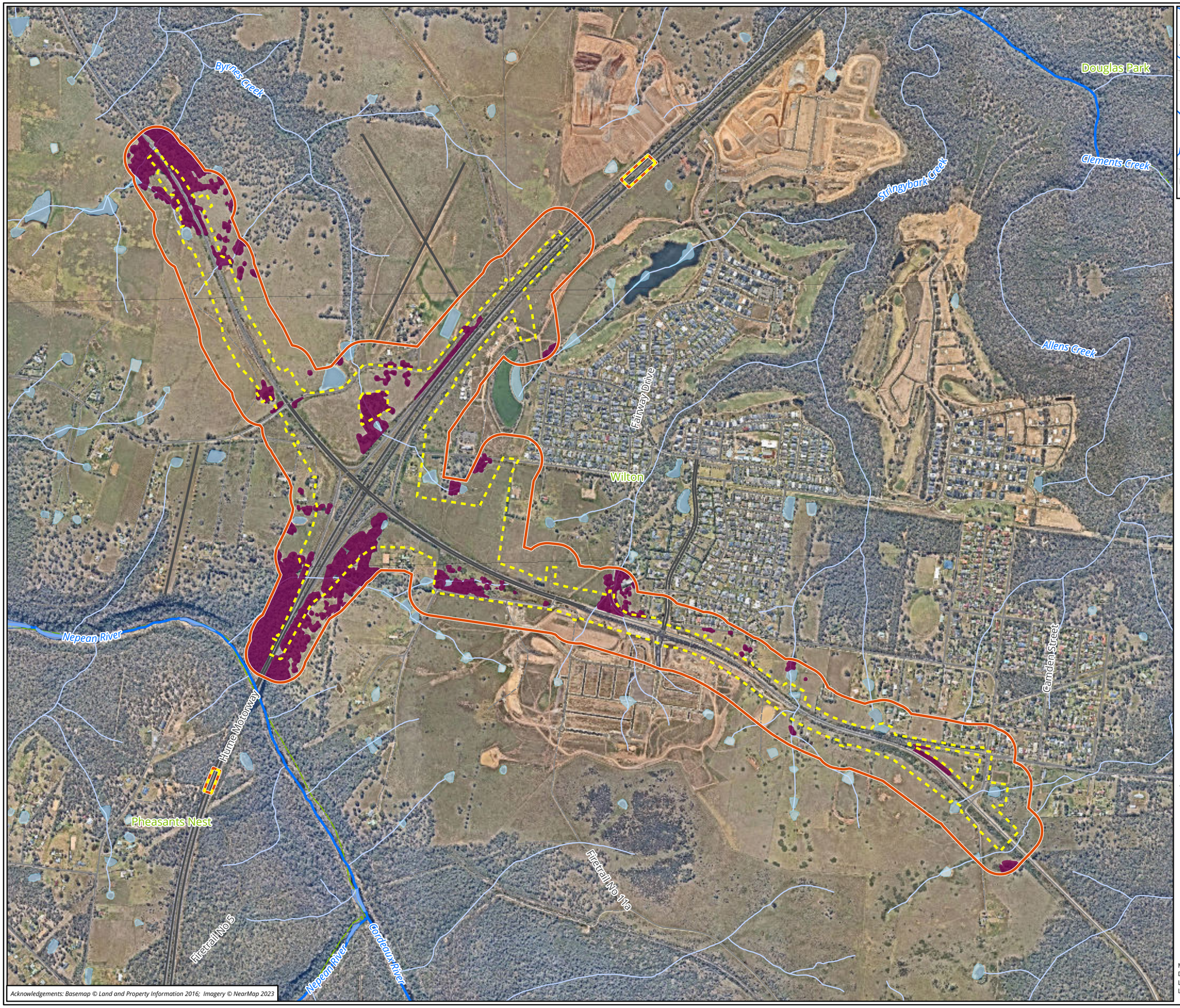

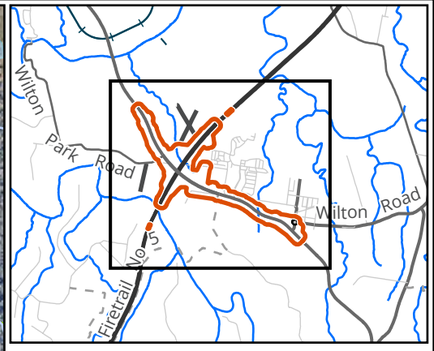

Legend

- Study area
- Proposal site

Threatened species polygon (breeding habitat)

- Large-eared Pied Bat - *Chalinolobus dwyeri*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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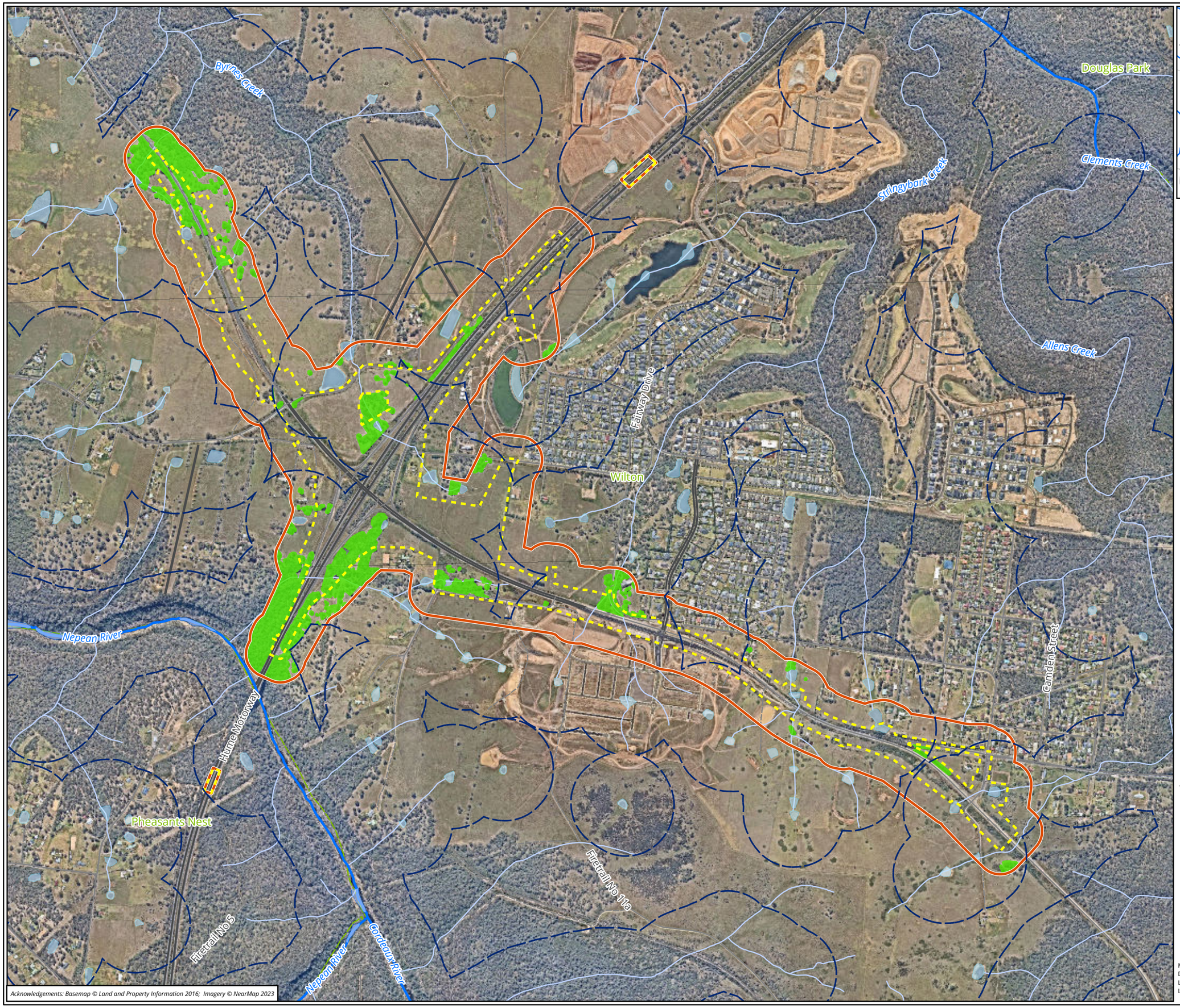

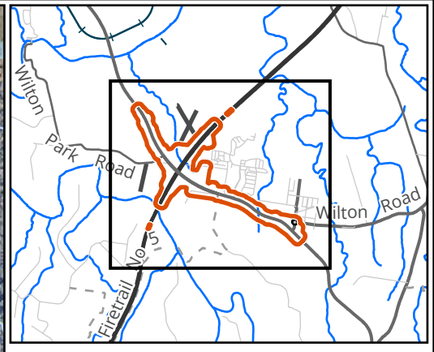

Legend

- Study area
- Proposal site
- Dams and second order or higher waterways buffer (200m)

Threatened species polygon (breeding habitat)

- Southern Myotis - *Myotis macropus*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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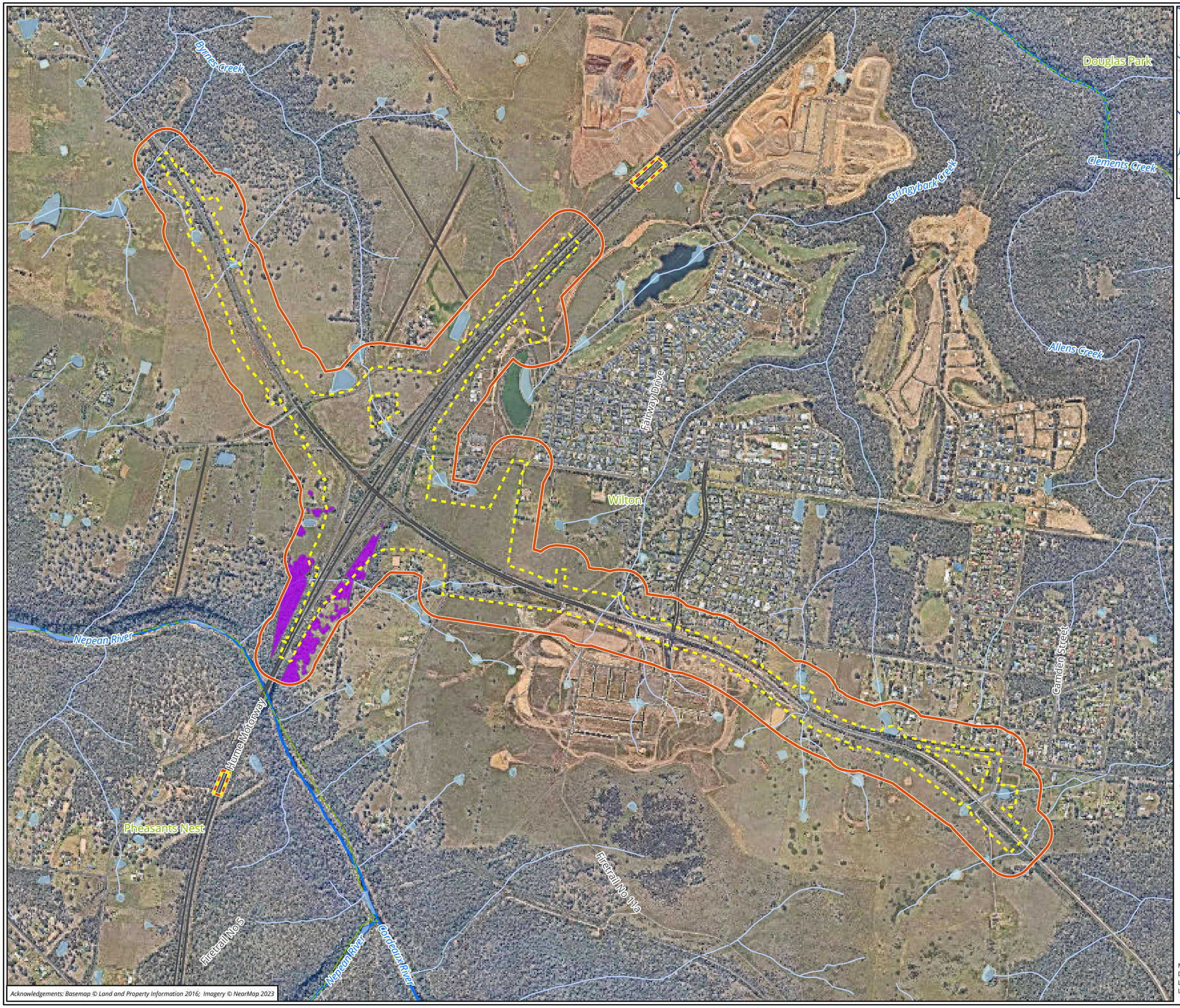

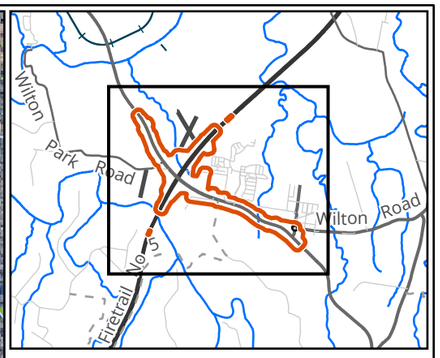

Legend

- Study area
- Proposal site

Threatened species polygon

- Austral Pilwort - *Pilularia novae-hollandiae*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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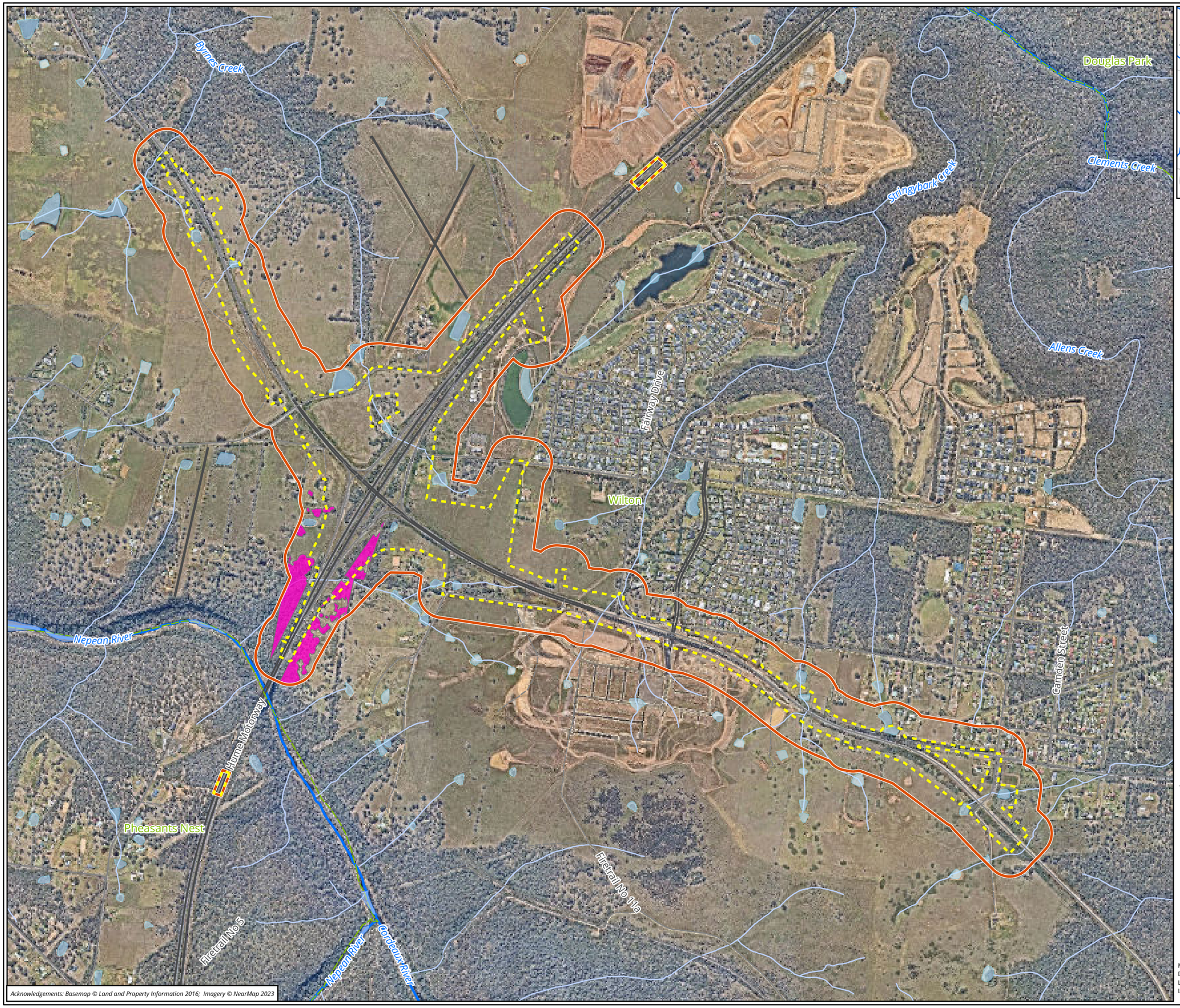

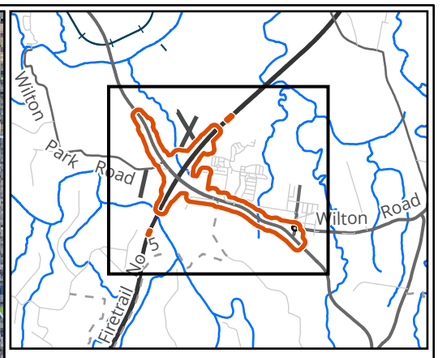

Legend

- Study area
- Proposal site

Threatened species polygon

- *Hibertia puberula*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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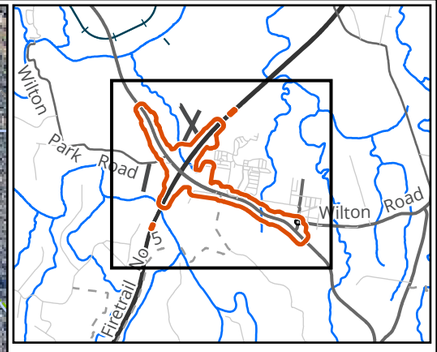

Legend

- Study area
- Proposal site

Threatened species polygon

- Matted Bush-pea - *Pultenaea pedunculata*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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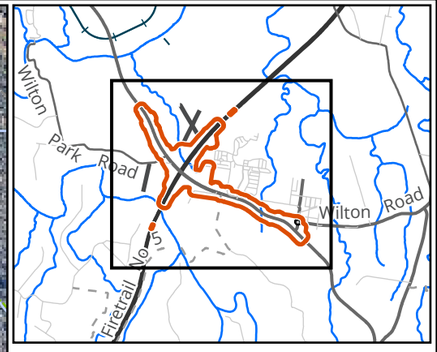

Legend

- Study area
- Proposal site

Threatened species polygon

- Sydney Plains Greenhood - *Pterostylis saxicola*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

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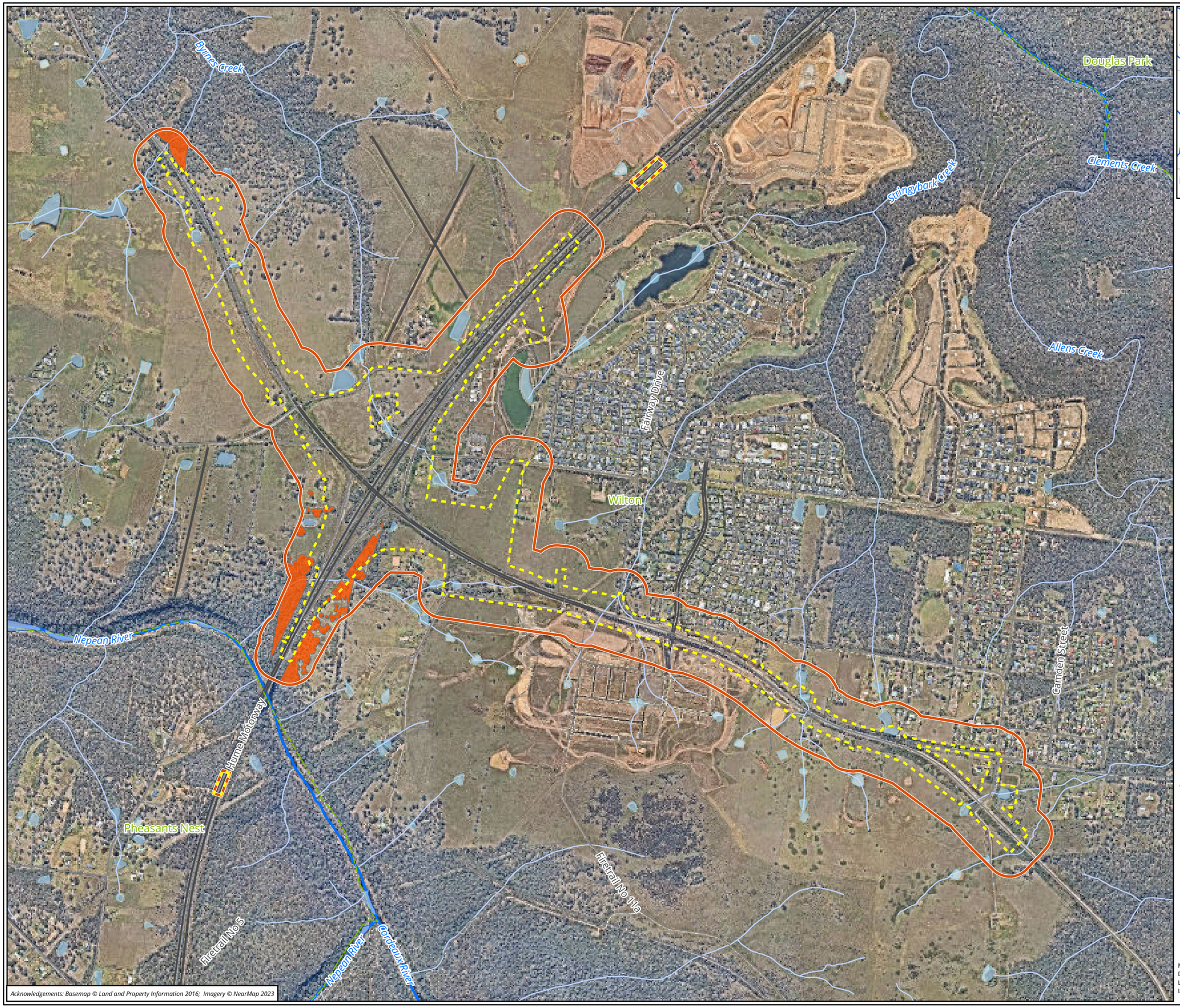

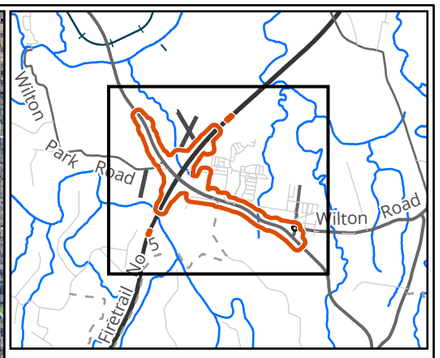

Legend

- Study area
- Proposal site

Threatened species polygon

- Thick Lip Spider Orchid - *Caladenia tessellata*

Figure 3-4: Recorded threatened species

0 200 400 600

Metres

Scale: 1:15,000 @ A3

Coordinate System: GDA2020 MGA Zone 56

N

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3.8 Aquatic results

Distribution mapping for threatened species indicates that the Nepean River may provide potential habitat for the following threatened aquatic species:

- Macquarie Perch *Macquaria australasica* (Endangered FM Act and EPBC Act).
- Sydney Hawk Dragonfly *Austrocordulia leonardi* (Endangered FM Act and EPBC Act).

No other waterways within the study area were considered likely to contained threatened aquatic species listed under the FM Act, as they were highly degraded first and second order streams. The proposal site does not extent into the riparian corridor of the Nepean River (40 metres to the closest point of the proposal site).

Waterways within the study area are classified based on the Strahler order of classification (Strahler 1964). The study area contains a total of 10 waterways which include:

- Six unnamed first order waterways.
- One named first order waterway (Byrne's Creek).
- Two unnamed second order waterways.
- One named second order waterway (Stringybark Creek).
- Thirteen (13) farm dams.

The study area also incorporates sections of the Nepean River which is a seventh order waterway, where the existing roads bridge the river (Figure 1-2). It is noted that the study area does not extend over or close to the Nepean River. No sections of the Nepean River are located within the proposal site.

While portions of Byrnes Creek are mapped as Key Fish Habitat (DPI 2023), the portion of the waterway which flows through the study area represents the headwaters of this creek and as such does not fall within key fish habitat mapping as it is a first order waterway. With the exception of the Nepean River, no other waterways within the study area are mapped as, or consistent with the definition of Key Fish Habitat under Section 3.2.1 of the Policy and guidelines for fish habitat conservation and management (Fairfull 2013) as all waterways are first and second order streams. Furthermore, it is considered unlikely that these waterways provide any habitat for threatened aquatic flora or fauna listed under the FM Act, as the waterways are highly degraded as a result of historic clearing and ongoing land management practices including livestock grazing. Overall bank stability, habitat availability, riffle/pool quality and substrate composition was very poor, with most waterways exhibiting high levels of erosion.

The Nepean River represents the only significant Key Fish Habitat within the study area as mapped by DPI (DPI 2023). As this waterway is likely to contain significant in-stream habitat and is a major waterway, it is likely that this waterway would be consistent with a Type 1 (Highly sensitive key fish habitat) and Class 1 (Major key fish habitat) waterway (Fairfull 2013). Although incorporated into the study area due to the 100 metre buffer applied to the proposal site does not extend to the Nepean River or the surrounding gorge.

3.9 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value mapped within the study area or broader assessment area.

3.10 Wildlife connectivity corridors

The majority of the vegetation within the study area is well connected both within the study area, and to vegetation outside of the study area. Moderate to High quality vegetation occurs in the south and western extents of the study area, where the proposal approaches the Nepean River.

Vegetation outside of the study area is comprised of the same PCTs in similar condition classes (moderate-high) as those located within the study area. The well connected, moderate to high quality vegetation occurs in a linear band along the Nepean River Gorge in the south and west (Figure 2-1). To the east of the M31 Hume Motorway, the proposal site contains primarily cleared areas containing minimal native vegetation. At the far eastern extent of the study area, vegetation outside of the proposal site forms the western edge of intact native vegetation associated with the Illawarra Escarpment (Figure 2-1).

3.11 State Environmental Planning Policies

3.11.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.109 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposal is for a road and road infrastructure facilities and is to be carried out by Transport, it can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW). Development consent from Council is not required.

Further information is provided in section 4.1 of the REF.

3.11.2 State Environmental Planning Policy (Biodiversity and Conservation) 2021

State Environmental Planning Policy (Biodiversity and Conservation) 2011 (SEPP Biodiversity and Conservation) outlines the planning principles for development in NSW in relation to the protection and conservation of biodiversity. The SEPP is split into chapters focussing on a specific focus area, including vegetation in non-rural areas, Koala habitat protection, bushland in urban areas, water quality objectives for the Sydney drinking water catchment, and management of the environment along key river systems.

Chapter 13 of the SEPP Biodiversity and Conservation does not apply to activities subject to Part 5 of the EP&A Act, as such it does not apply to the proposal. The proposal will not access the strategic assessment pathway.

Chapter 2: Vegetation in non-rural areas

This chapter aims to protect the biodiversity values of trees and other vegetation in non-rural areas of NSW and to preserve the amenity of non-rural areas through the preservation of trees and other vegetation by ensuring that the BOS will apply to all clearing of native vegetation that exceeds the offset thresholds in urban areas and environmental conservation zones that do not require development consent.

The proposal is within Wollondilly Shire Council which is not a listed LGA under Chapter 2 (2.3 land to which Chapter applies).

Chapter 4: Koala Habitat Protection

Chapter 4 Koala Habitat Protection aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of Koala population decline.

The study area is located within the Wollondilly LGA, which is listed under Schedule 2, Chapter 4 of SEPP. Chapter 4 of the SEPP aims to encourage the conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. Part 4.2 of the SEPP regulates impact on koala habitats as part of the development assessment process. Although the provisions of Chapter 4 of the SEPP do not apply to the proposal as the proposal is an activity for the purposes of Division 5.1 of the EP&A Act, the potential impacts on koalas have been considered as part of this report (see section 5.1.4).

3.11.3 Cumberland Plain Conservation Plan

The Cumberland Plain Conservation Plan (CPCP) is a strategic conservation plan prepared under SEPP (Biodiversity and Conservation) that aims to support Western Sydney's growth and the region's native plants and animals. The CPCP maps certified-urban capable land (where development can proceed without further biodiversity approvals) and avoided land (land avoided from development due to high biodiversity values).

Chapter 13 (Strategic Conservation Planning) of SEPP (Biodiversity and Conservation) sets out the planning controls to achieve the development and biodiversity outcomes of the CPCP. There are a number of planning controls that apply to different land categories to support the implementation of biodiversity and development commitments of the CPCP. The land categories are identified as:

- avoided land

- certified-urban capable land
- land in a strategic conservation area.

The majority of the proposal site is located on land mapped as excluded land by the CPCP (see Figure 1-5) as it is located within an existing road corridor. Other areas are located on land mapped as certified – urban capable land. The proposal would affect a small area (up to about 144 m^2) of land mapped as avoided land.

Land mapped as excluded land has been excluded from the planning controls under the CPCP. In these areas, the BC Act, the FM Act and where relevant the EPBC Act apply.

Land mapped as certified – urban capable land has been identified for future urban development. This land is biodiversity certified under Part 8 of the BC Act, and as such, development under Part 5 of the EP&A Act on biodiversity certified land does not require assessment of the potential impact on biodiversity. Additionally, development in these areas does not require further site-by-site biodiversity assessment or approval under the BC Act, as long as it is consistent with the CPCP and its approvals (including mitigation measures).

Approval under Part 10 of the EPBC Act is yet to be issued by the Australian Government. Assessment under the EPBC Act is still required for development on land mapped as certified – urban capable land.

Land mapped as avoided land has been identified for biodiversity conservation. In these areas, the BC Act, FM Act and where relevant the EPBC Act apply. Activities within these areas must also be consistent with Section 3.1.2 of the Cumberland Plain Conservation Plan Guidelines for Infrastructure Development (DPIE, 2022).

The Cumberland Plain Conservation Plan Guidelines for Infrastructure Development (DPIE, 2022) applies to Part 5 activities under the EP&A Act that are carried out on land identified as avoided land, certified- urban capable land, or a strategic conservation area. The guidelines aim to ensure infrastructure development and activities are consistent with the CPCP's commitments and actions and maintain outcomes consistent with SEPP (Biodiversity and Conservation). The guidelines identify when and how essential infrastructure is covered by the CPCP's strategic assessment approval under Part 10 of the EPBC Act – pending Australian Government approval of the CPCP.

The Cumberland Plain Conservation Plan Guidelines for Infrastructure Development also set out the requirements to avoid, minimise and mitigate impacts on biodiversity from infrastructure activities carried out under Part 5 of the EP&A Act on land identified as avoided land, certified – urban capable land, and a strategic conservation area. As such, the mitigation and management measures provided in section 6 have considered the provisions of the guidelines to manage the potential impacts on biodiversity.

An assessment against sections 3.1 and 3.2 of the infrastructure guidelines is provided below in Table 3-16.

In accordance with Section 201A of the Environmental Planning and Assessment Regulation 2021 (the EP&A Regulation), a determining authority for an activity carried out under SEPP (Transport and Infrastructure) on avoided land must give notice to the Planning Secretary of a decision to carry out the activity within 30 days after a decision has been made.

Further information on the biodiversity impacts of the proposal, including impacts on land certified under the CPCP, is provided in section 5.1.

Table 3-16: Assessment against Section 3.1 of the CPCP infrastructure guidelines

Section 3.1	Assessment against the proposal
For all other activities to which these guidelines apply, the activity must: *1. Avoid an adverse impact on threatened ecological communities, threatened species and their habitats, both on the site of the activity and on adjoining land that is avoided land.*	As discussed in section 4 of this report, the proposal site has been refined to minimise impacts to Avoided Land as far as possible. The proposal would impact on up to 0.01 ha of avoided land as described in section 5.1.1. Avoidance measures implemented include: • Utilising cleared and/or disturbed areas as much as possible, including strategic location of construction facilities. • Proposal site has been refined to minimise impacts, as far as practicable, on areas of high biodiversity value within the CPCP. • Widening the existing road (as opposed to constructing a new offline new road) and minimising widening outside of the existing road reserve as far as practicable possible. • Fauna exclusion fencing is currently installed as part of a separate project along heavily vegetated sections of Picton Road and the M31 Hume Motorway, where vegetation occurs in association with the Nepean River Gorge, to reduce collision risk and prevent mortality by vehicle strike for fauna seeking to cross the roads. Most of the portions of the study area that occur within avoided lands correspond to the location of this fencing, and it would be adjusted and reinstalled and/or remain in situ post completion of construction works. An adverse impact is not anticipated as the proposal has avoided impacts to threatened entities and mitigated where impacts are not avoidable.
2. Avoid an adverse impact on habitat connectivity and fauna movement, including koala and wildlife corridors, both on the site of the activity and on adjoining land that is avoided land	Road widening can result in an increased barrier to dispersal for fauna species. Picton Road and the M31 Hume Motorway are arterial roads, with the M31 Hume Highway being a high-speed road with limits ranging from 80 to 110 kilometres per hour. This speed provides a significant collision risk for terrestrial, non-flying species such as Koala. However, the Pheasants Nest bridge (located on the M31 Hume Motorway, over the Nepean River in the south of the study area) provides existing passage for fauna which may pass under these bridges. Fauna exclusion fencing is being erected as part of a separate project prior to commencement of the proposal, along heavily vegetated sections of Picton Road and the M31 Hume Motorway. The fencing is being completed as part of a separate Transport project to assist in encouraging fauna movement through these existing safe passages. The fencing would remain in place where possible. Any fauna fencing impacted by the proposal would be replaced with temporary fencing during construction and new fencing installed at completion of construction.
3. Avoid an adverse impact on the integrity and resilience of the biophysical, ecological, and hydrological environments, including surface and groundwater, and the quality of the natural flow of water in a riparian corridor	It is not anticipated that the proposal would adversely impact upon components listed in this criterion, and in the case of surface water quality, would have the potential for an improved effect post-construction. This is because the proposal would improve existing surface drainage and provide new drainage (including water quality) infrastructure.

4. Avoid an adverse impact on matters of national environmental significance (*MNES) referred to in Chapter 2, Part 3, Division 1 of the EPBC Act*	No significant impacts to any MNES are considered likely as detailed by the completed SIC assessments in Appendix D: Assessments of significance (EPBC Act).
5. Install temporary koala-exclusion fencing before construction in areas identified as koala habitat protected by the CPCP and maintain the integrity of any existing koala-exclusion fencing	Areas mapped as protected Koala habitat under the CPCP is present adjacent to the M31 Hume Motorway in the southern extent of the study area. A small linear patch (0.01 ha) may be impacted by the proposal, as described in 5.1.1. Fauna exclusion fencing currently is being completed as part of a separate Transport project along heavily vegetated sections of Picton Road and the M31 Hume Motorway, where vegetation occurs in association with the Nepean River Gorge, to reduce collision risk and prevent mortality by vehicle strike for fauna seeking to cross the roads. The fencing would remain in place where possible. If this fencing is required to be removed for the proposed works, Transport would relocate this fencing, or utilise temporary fencing during construction and replace as soon as practical.
6. Design linear infrastructure to include appropriate access treatments such as gates or koala bridges to ensure the integrity and connectivity of koala corridors and habitat protected under the CPCP is maintained.	As mentioned above, protected Koala habitat mapping under the CPCP is present on the southern extent of the study area on the road verge of the M31 Hume Motorway. The motorway already exists as a barrier to Koala movement. Given there is already a barrier, impacts to a small linear patch (0.01) would be unlikely to further influence the current level of connectivity to the surrounding area. Therefore, the level of integrity of the connected habitat protected under the CPCP would remain the same after the proposal has been completed.

3.12 Matters of national environmental significance

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on matters of national environmental significance (MNES) protected under the Act. There are nine MNES identified under the EPBC Act:

- world heritage properties
- national heritage places
- wetlands of international importance (also known as 'Ramsar' wetlands)
- nationally threatened species and ecological communities
- migratory species.
- Commonwealth marine areas
- The Greater Barrier Reef Marine Park
- nuclear actions (including uranium mining)
- a water resource, in relation to coal seam gas development and large coal mining development.

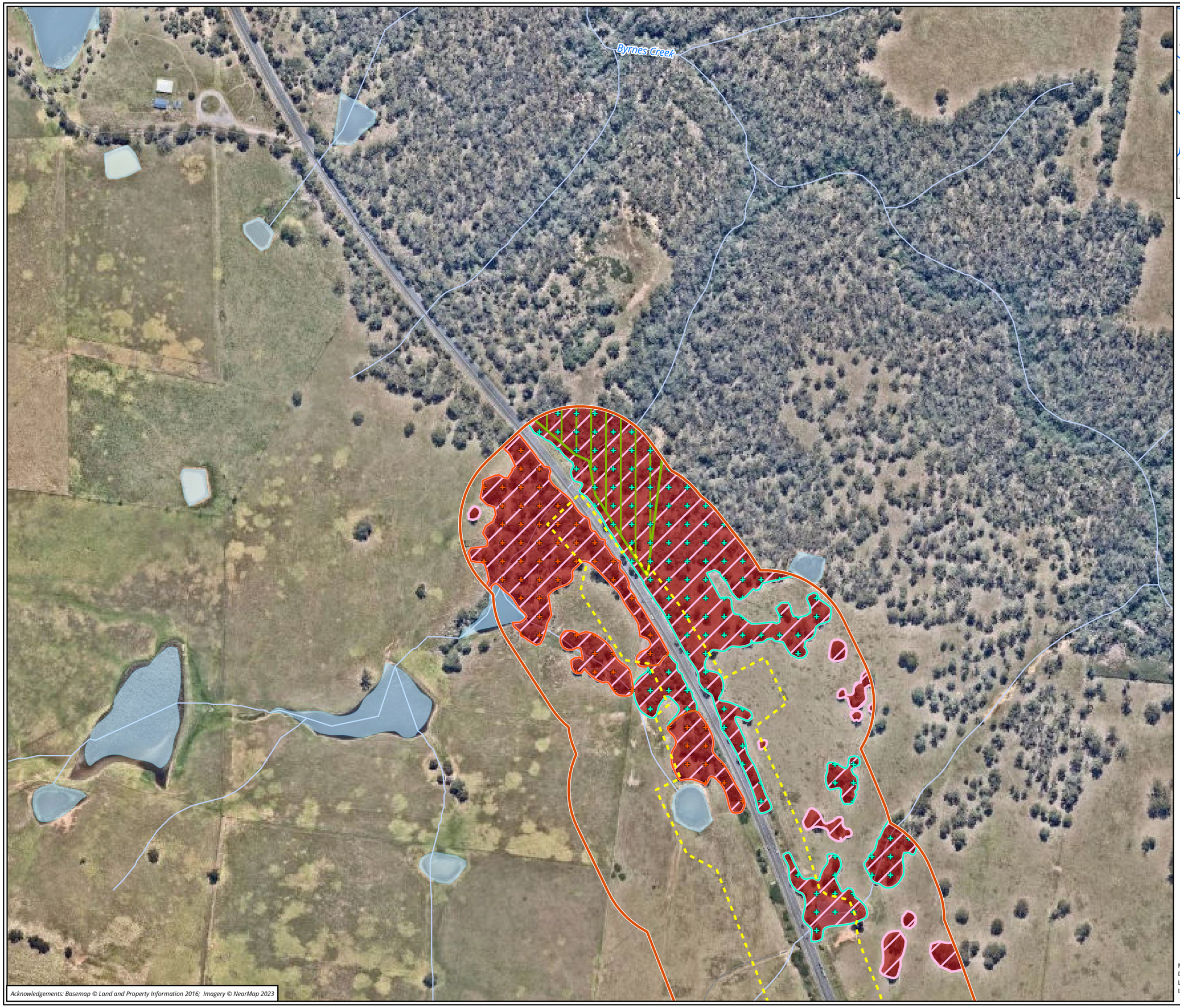
Under the EPBC Act, activities that have potential to result in significant impacts on MNES must be referred to DCCEEW for assessment. In addition to MNES, if an action is proposed that is either situated on, or which may impact upon, Commonwealth land, an assessment against significant impact guidelines 1.2: Actions on, or impacting upon, Commonwealth land and actions by Commonwealth agencies is required. As Commonwealth land is not impacted upon, further consideration of guideline 1.2 is not required.

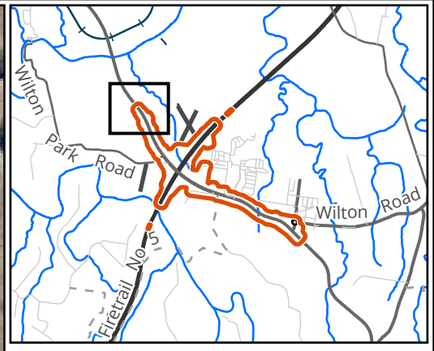
An assessment of the impacts of the proposal on MNES relevant to the proposal, in accordance with the MNES significant impact guidelines (Commonwealth of Australia 2013) was prepared (Appendix D) to determine whether referral of the proposal to the Commonwealth Minister for the Environment is required. This includes the completion of Significant Impact Criteria (SIC) assessments for threatened species and TECs. A referral is not required as the proposal are proceeding under the

'strategic assessment' approval granted by the Australian Minister for the Environment in accordance with the EPBC Act. This approval applies to transports road activities being assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities, and migratory species.

The matters of national environmental significance assessed for this report are displayed on Figure 3-5 and include:

- Threatened Ecological Communities:
  - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
  - Shale Sandstone Transition Forest in the Sydney Basin Bioregion
- Threatened flora:
  - Thick Lip Spider Orchid *Caladenia tessellata*
  - Sydney Plains Greenhood *Pterostylis saxicola*
- Threatened fauna:
  - Koala *Phascolarctos cinereus*
  - Grey-headed Flying-Fox *Pteropus poliocephalus*
  - Large-eared Pied Bat *Chalinolobus dwyeri.*





Legend

- Study area
- Proposal site

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened species polygon

- Koala - *Phascolarctos cinereus*
- Large-eared Pied Bat - *Chalinolobus dwyeri*
- Sydney Plains Greenhood - *Pterostylis saxicola* and Thick Lip Spider Orchid - *Caladenia tessellata*

Figure 3-5: Matters of national environmental significance
Page 1

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Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

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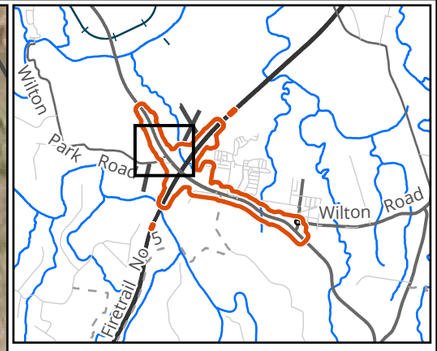

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- Study area
- Proposal site

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened species polygon

- Koala - *Phascolarctos cinereus*
- Large-eared Pied Bat - *Chalinolobus dwyeri*
- Sydney Plains Greenhood - *Pterostylis saxicola* and Thick Lip Spider Orchid - *Caladenia tessellata*

Figure 3-5: Matters of national environmental significance
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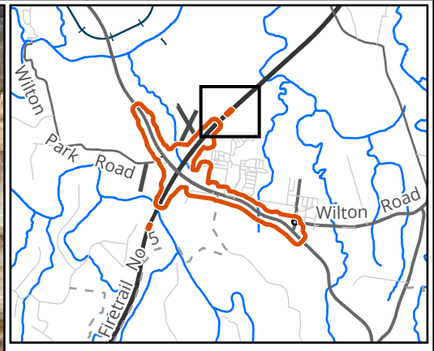

Legend

- Study area
- Proposal site

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)

Figure 3-5: Matters of national environmental significance
Page 3

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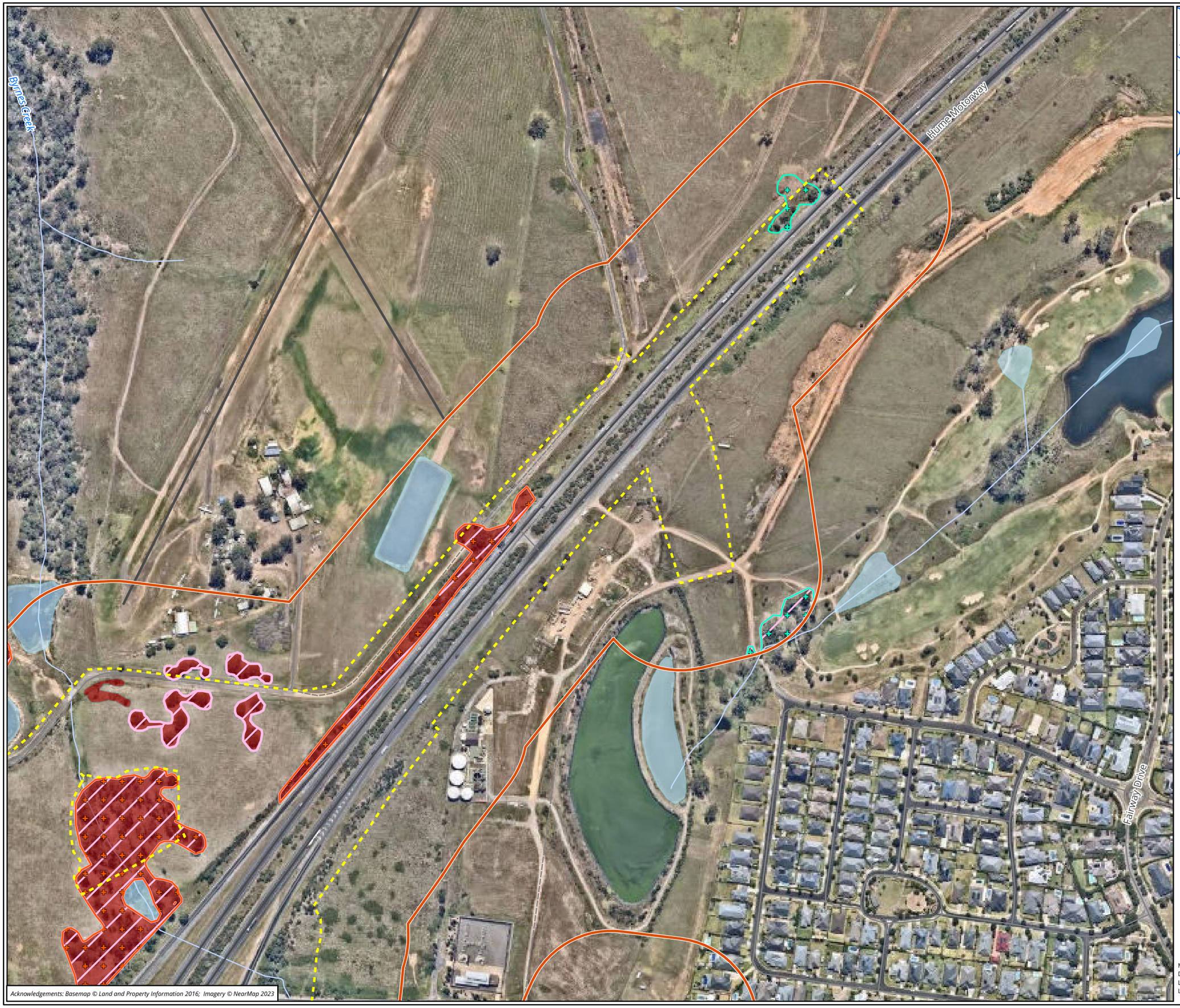

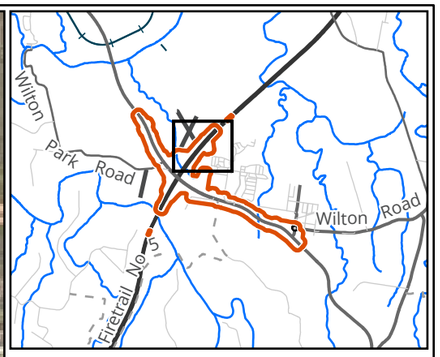

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- Study area
- Proposal site

Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened species polygon

- Koala - *Phascolarctos cinereus*
- Large-eared Pied Bat - *Chalinolobus dwyeri*

Figure 3-5: Matters of national environmental significance
Page 4

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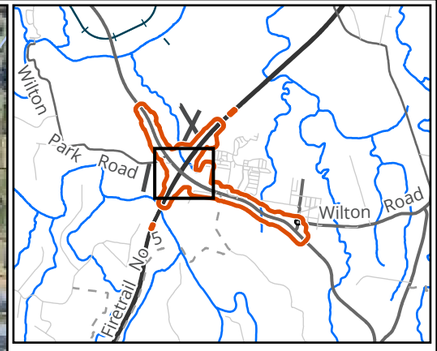

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- Study area
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Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened species polygon

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- Large-eared Pied Bat - *Chalinolobus dwyeri*
- Sydney Plains Greenhood - *Pterostylis saxicola* and Thick Lip Spider Orchid - *Caladenia tessellata*

Figure 3-5: Matters of national environmental significance
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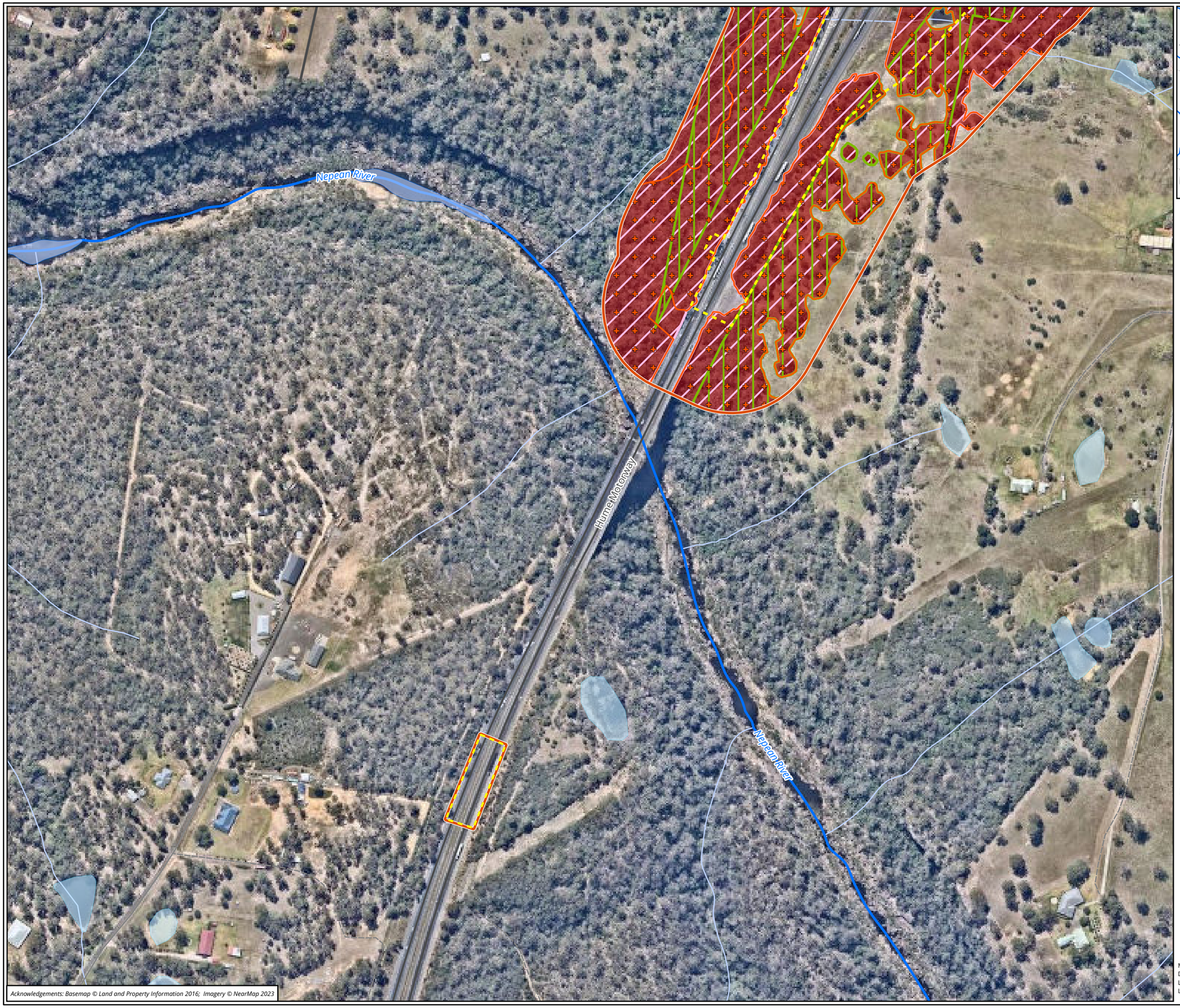

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- Study area
- Proposal site

Threatened ecological communities (EPBC Act)

- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened species polygon

- Koala - *Phascolarctos cinereus*
- Large-eared Pied Bat - *Chalinolobus dwyeri*
- Sydney Plains Greenhood - *Pterostylis saxicola* and Thick Lip Spider Orchid - *Caladenia tessellata*

Figure 3-5: Matters of national environmental significance
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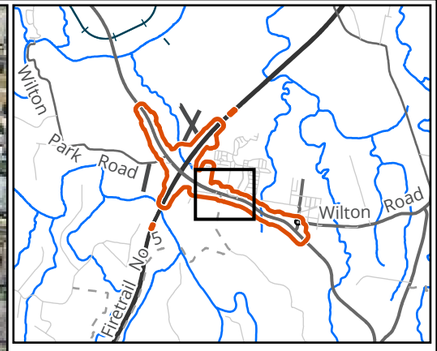

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Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)

Threatened species polygon

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- Large-eared Pied Bat - *Chalinolobus dwyeri*

Firetrail No 11a

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Figure 3-5: Matters of national environmental significance
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Threatened ecological communities (EPBC Act)

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- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened species polygon

- Koala - *Phascolarctos cinereus*
- Large-eared Pied Bat - *Chalinolobus dwyeri*

Figure 3-5: Matters of national environmental significance
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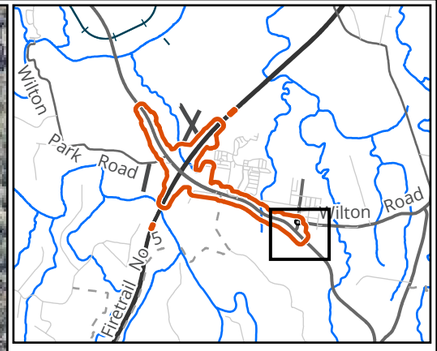

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Threatened ecological communities (EPBC Act)

- Cumberland Plain Shale Woodlands and Shale-gravel Transition Forest (CEEC)
- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC)

Threatened species polygon

- Koala - *Phascolarctos cinereus*
- Large-eared Pied Bat - *Chalinolobus dwyeri*

Figure 3-5: Matters of national environmental significance
Page 9

0 50 100 150

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA2020 MGA Zone 56

N

biosis

Matter: 36086, Date: 17 October 2023
Drawn by: JB, Checked by: JS, Last edited by: jbeckius
Location: P:\36000s\36086\Mapping\36086_Updates_20230809.aprx
Layout: 36086_F3-5_MONES

4. Avoidance and minimisation

In accordance with the BAM, proponents must demonstrate the measures employed to avoid, mitigate, and offset impacts of a proposal on biodiversity values. This section of the report outlines the details from the REF associated with avoidance, planning, management, and mitigation measures that Transport has incorporated into the proposal design and planning or would employ during construction or operation of the proposal to reduce impacts on biodiversity values. Detailed measures that would be employed to manage and mitigate potential impacts of the proposal are provided below.

4.1 Justification for the Project

Justification for the proposal is provided in section 8.1 of the REF.

4.2 Avoiding and minimising impacts

As is common for infrastructure projects, opportunities to avoid and minimise impacts to the biodiversity values are often limited. The option development and design refinement process for the proposal as a whole is summarised in chapter 2 of the REF. As noted in chapter 2, the proposal has been subject to a detailed assessment, which included assessment of a broad study area to identify key constraints early in the design process and assist with avoiding and minimising impacts, including impacts on biodiversity, as far as practicable. Key biodiversity constraints considered as part of the option development and design process included areas of high biodiversity value, such as remnant native vegetation, in particular TECs listed under the BC Act and EPBC Act, and known or potential habitat for threatened species.

4.2.1 Mitigating impacts

Where practicable, Transport have altered the proposal site to avoid and minimise ecological impacts in the proposal planning stage. A range of impact mitigation strategies would be included in the proposal to mitigate potential impacts on ecological values prior to consideration of offsetting requirements, as described in chapter 6 of the REF.

4.2.2 Refinements to the proposal site

The proposal site is considered to be the minimum required to provide a functional and safe roadway. The refinements to the proposal site that were undertaken also:

- Avoids (where possible) areas of high biodiversity values within land mapped as strategic conservation land, Koala habitat and avoided land under the CPCP.
- Widens existing roads (as opposed to providing an entirely new road corridor) and minimises widening outside of the existing road reserve as far as practicable.
- Utilises cleared and/or disturbed areas as much as possible, including strategic location of construction facilities.

Fauna exclusion fencing is being completed as part of a separate Transport project along heavily vegetation sections of Picton Road and the M31 Hume Motorway, where vegetation occurs in association with the Nepean River Gorge, to reduce collision risk and prevent mortality by vehicle strike for fauna seeking to cross the roads.

4.3 Mitigating and offsetting impacts

As described in section 5, there would be impacts to biodiversity as a result of the proposal that are not avoidable. As a result, standard and site-specific mitigation measures and safeguards would be applied to ameliorate or minimise these predicted impacts. These mitigation measures included implementation of the *No Net Loss Guidelines* (Transport for NSW 2022a) and Tree and Hollow Replacement Guidelines (Transport for NSW 2022b). These are detailed in section 6.

As offset requirements for the purposes of this BAR are generated using the BAM-C, impact calculations used and imported into the BAM-C relate to impacts associated with BC Act listed entities only, which as mentioned above does not include areas mapped as certified under the CPCP. Preliminary calculations of offsets for each threshold category triggered above are provided below in Table 7-3 and Table 7-4. Calculations for impacts to ecosystem and species credit species have been completed using the BAM-C.

5. Impact assessment

The proposal would result in a range of direct and indirect impacts, including:

- Direct impacts resulting from:
    - Removal of native vegetation, including TECs.
    - Removal of threatened fauna habitat
    - Removal of threatened flora habitat.
    - Aquatic impacts.
    - Injury and mortality.
    - Groundwater dependent ecosystems.
- Indirect and operational impacts, including:
    - Edge effects on adjacent native vegetation.
    - Wildlife connectivity and habitat fragmentation.
    - Injury and mortality.
    - Invasion and spread of weeds.
    - Invasion and spread of pests, pathogens and disease.
    - Changes to hydrology.
    - Noise, light, dust and vibration.

5.1 Construction direct impacts

5.1.1 Cumberland Plain Conservation Plan

The proposal would impact on the following areas of land under the CPCP:

- Avoided Land: up to 0.01 ha
- Excluded Land: up to 76.93 ha
- Certified - Urban Capable Land: up to 34.54 ha.

5.1.2 Removal of native vegetation

The proposal would result in the removal of up to 13.10 hectares of native vegetation comprising of two PCTs in various condition states. The BAR however, only assesses impacts to 'Excluded' and 'Avoided' land under the EPBC Act and BC Act, and impacts on 'Certified – Urban Capable Land' under the EPBC Act only. Impacts to native vegetation are provided in Table 5-1.

The proposal would also result in the removal of up to 13 hollow bearing trees identified during the field surveys.

5.1.3 Impacts to TECs

The native vegetation within the proposal site consists of two TECs, which would be impacted by vegetation removal:

- Shale Sandstone Transition Forest in the Sydney Basin Bioregion (CEEC) (6.59 ha EPBC Act and 5.67 ha BC Act).
- Cumberland Plain Woodland in the Sydney Basin Bioregion (CEEC) (4.01 ha EPBC Act and 3.64 ha BC Act).

It should be noted that offset requirements for the purposes of this BAR are generated using the BAM-C. Therefore, impact calculations used and imported into the BAM-C relate to impacts associated with BC Act listed entities only. Impact calculations entered into the BAM-C do not include areas mapped as certified under the CPCP. In contrary, the impacts under

the EPBC Act contain areas mapped as certified under the CPCP, hence the differences between the totals of native vegetation and TEC clearing below.

Significance assessments via a NSW ToS (Appendix C) and Commonwealth SIC assessments (Appendix D) were undertaken for the impacts to the TECs listed above. In all cases, a significant impact is not considered likely. This conclusion was reached on the basis that impacts primarily occur in a linear nature, predominantly affecting the roadside edges of larger patches. Hence, while impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities.

Impacts would also be offset via the *No Net Loss Guidelines* (Transport for NSW 2022a) and Tree and Hollow Replacement Guidelines (Transport for NSW 2022b), which incorporates the consideration of non-statutory offsets under the BAM-C for impacts to TECs and BAM species credit species determined to be impacted by the proposal (see sections 6 and 7).

Table 5-1: Summary of assessed direct impacts on native vegetation

Veg. zone	Plant community type (PCT)	TEC	Total impact including certified land (ha)	Impacts to be assessed under BC Act (ha)	Impacts to be assessed under EPBC Act (ha)
Zone 1_849 Moderate	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC, BC Act and EPBC Act	4.01	2.78	4.01
Zone 2_849 Scattered Trees	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC, BC Act	0.03	0.02	-
Zone 3_ 849 DNS	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC, BC Act	1.20	0.39	-
Zone 4_849 DNG	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC, BC Act	0.53	0.45	-
Sub-total:			5.77	3.64	4.01
Zone 5_1181 High	1181: Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	Not a TEC	N/A - No impact	N/A - No impact	-
Zone 6_ 1395 High	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	0.05	0.05	0.05

Veg. zone	Plant community type (PCT)	TEC	Total impact including certified land (ha)	Impacts to be assessed under BC Act (ha)	Impacts to be assessed under EPBC Act (ha)
	the edges of the Cumberland Plain, Sydney Basin Bioregion	CEEC, EPBC Act and BC Act			
Zone 7_1395 Moderate	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC, EPBC Act and BC Act	1.40	1.37	1.40
Zone 8_ 1395 Low	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC, EPBC Act and BC Act	5.14	4.21	5.14
Zone 9_1395 Scattered Trees	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC, BC Act	0.42	N/A - No impact	-
Zone 10_1395 DNS	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Shale Sandstone Transition Forest in the Sydney Basin Bioregion CEEC, BC Act	0.32	0.04	-
Zone 11_877 High	877: Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion	Not TEC	N/A - No impact	N/A - No impact	N/A - No impact
Sub-total:			7.33	5.67	6.59
Total:			**13.10**	**9.31**	**10.60**

5.1.4 Removal of threatened fauna habitat

The vegetation removal described below would have the potential to impact fauna habitat, including habitat for threatened fauna species. Eight threatened fauna species would have the potential to be impacted by fauna habitat removal in the proposal site, as listed in Table 5-2. Of these species, five are ecosystem credit species and three are species credit species, as described by the credit type in Table 5 2.

During field investigations, 20 hollow-bearing trees containing numerous hollows of varying size were identified within the study area. Of these hollow-bearing trees, 13 occur within the proposal site (Table 3-14).

Species habitat polygons have been developed for impacts to species credit species. Habitat polygons for threatened species have been developed in accordance with information provided by the TBDC (DPE 2023a) and relevant guidelines. However, cleared areas, non-offsetable grasslands, derived native grasslands and derived native shrublands have not been included in the production of species polygons for threatened bats. Although these species could move and forage across cleared and open grassy areas, these areas did not contain suitable roosting habitat features and do not contain features which provide foraging habitat.

These impacts have been based on assuming that all native vegetation within the proposal site would be removed during construction, therefore the totals reflect a worst-case impact scenario.

Table 5-2: Summary of direct impacts on threatened fauna and habitat

Species name	EPBC Act	BC Act	Credit type[1]	Potential occurrence (Moderate, High, Recorded)	Associated habitat in study area	Habitat within the proposal site	Impacts to be assessed under BC Act (ha)	Impacts to be assessed under EPBC Act (ha)
Koala	EN	EN	Species	Recorded	PCT 849, PCT 1181 and PCT 1395	10.06	7.52	10.06
Southern Myotis	-	VU	Species	Potentially recorded (Acoustic record, species group)	PCT 1395, 849 and 1181 within 200m of waterbodies and waterways with pools/stretches greater than 3m wide.	7.84	7.84	-
Large-eared Pied Bat	VU	VU	Species	Recorded	All habitat on the proposal site within 2 km of caves, scarps, cliffs and rock overhangs (i.e. Nepean River).	10.46	8.27	10.46
Little Lorikeet	-	VU	Ecosystem	Recorded	PCT 1395, 849, 877, and 1181	8.40	8.40	-
Eastern Coastal Free-tailed Bat	-	VU	Ecosystem	Recorded	PCT 1395, 849, 877, and 1181	8.40	8.40	-
Yellow-bellied Sheathtail-bat	-	VU	Ecosystem	Recorded	PCT 1395, 849, 877, and 1181	8.40	8.40	-

Species name	EPBC Act	BC Act	Credit type[1]	Potential occurrence (Moderate, High, Recorded)	Associated habitat in study area	Habitat within the proposal site	Impacts to be assessed under BC Act (ha)	Impacts to be assessed under EPBC Act (ha)
Greater Broad-nosed Bat	-	VU	Ecosystem	Probable recording	PCT 1395, 849, 877, and 1181	8.40	8.40	-
Eastern False Pipistrelle	-	VU	Ecosystem	Potentially recorded (Acoustic record, species group)	PCT 1395, 849, 877, and 1181	8.40	8.40	-
Total threatened species habitat impacts						**10.46**	**8.27**	**10.46**

5.1.5 Removal of threatened flora habitat

Native vegetation removal has the potential to impact on habitat for threatened flora species. Although none were observed in the study area during targeted surveys (see section 3.7), five species have been assumed to be present for the purposes of this impact assessment.

Potential impacts to threatened flora species assumed to be present within the proposal site are summarised in Table 5-3. These impacts have been based on assuming that all native vegetation within the proposal site would be removed during construction, therefore the totals reflect a worst-case impact scenario.

Table 5-3: Summary of direct impacts on threatened flora

Species name	BC Act	EPBC Act	Potential occurrence	Habitat within the study area	Impacts to be assessed under BC Act (ha)	Impacts to be assessed under EPBC Act (ha)
Thick Lip Spider Orchid *Caladenia tessellata*	EN	VU	Assumed present	1.26	0.53	1.26
Sydney Plains Greenhood *Pterostylis saxicola*	EN	EN	Assumed present	1.26	0.53	1.26
Matted Bush-Pea *Pultenaea pedunculata*	EN	-	Assumed present	0.52	0.52	-
Hibbertia puberula	EN	-	Assumed present	0.52	0.52	-
Austral Pillwort *Pilularia novae-hollandiae*	EN	-	Assumed present	0.52	0.52	-
Total threatened species habitat impacts				1.26	0.53	1.26

5.1.6 Aquatic impacts

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened entities, and critical habitats listed under the FM Act must be assessed through a ToS process under Section 1.7 of

the EP&A Act. If assessment under Section 1.7 of the EP&A Act determines a project is likely to result in a significant effect to threatened species, populations or communities, then a SIS should be prepared.

Key Fish Habitat as mapped on the DPI spatial data portal is present within the northern and southern portion of the study area, along the Nepean River. The Macquarie Perch and Sydney Hawk Dragonfly, are both listed as endangered under the FM Act and are known to occur within the Nepean River. As works are not expected to occur within the 40 metre riparian corridor of the Nepean River, no impact to these species is expected to occur as a result of the proposed works, particularly as mitigation measures would be implemented to minimise indirect impacts such as sedimentation. Therefore, it is unlikely that threatened aquatic species, populations or communities listed under the FM Act in the study area are likely to be impacted by the proposal.

No direct impacts are expected to aquatic habitat providing Key Fish Habitat or wetlands. Sedimentation poses a potential indirect impact to areas downstream of the proposed works (see section 5.2.6). However, mitigation measures would be implemented during construction to prevent runoff into waterways. Waterways crossing Picton Road and the M31 Hume Motorway are already subject to a level of disturbance which is similar to that expected from the proposal, and the proposal is not expected to significantly change flow regimes, flooding regimes or hydrology.

5.1.7 Injury and mortality

The potential for wildlife injury or death could occur during construction. The clearing of vegetation may result in injury or death to resident fauna. Species at risk include nocturnal species such as possums, gliders and microbats which shelter during the day, and ground dwelling species such as snakes, lizards, and small mammals. There is also the risk of displaced fauna succumbing to predation, or stress induced by competing with existing resident populations for resources, particularly shelter / refuge habitat.

In summary, injury and mortality of fauna could occur during construction activities, including:

- During construction, when vegetation and habitat are being cleared.
- Collision/strike by machinery and plant.
- Collision with construction traffic.

Proposal-specific recommended mitigation measures are provided in section 6 for potential injury and mortality impacts.

5.1.8 Groundwater dependent ecosystems

As discussed in Section 3.4, the Atlas of GDEs (BOM 2023) (Figure 3-3) identifies vegetation within the study area adjacent to the Nepean River, as high/moderate potential GDEs.

Only moderate potential GDEs occur within study area, limited to a small area surrounding the riparian corridor of the Nepean River, which is on the boundary of the study area in the south, where PCT 1395 occurs. It should be mentioned that areas of modelled GDEs only occur within the study area and do not occur within the proposal site (GDE located about 80 metres to the south of the proposal site at its closest point).

While PCT 1395 is considered to have a high to moderate likelihood of being a GDE at the locations on Figure 3-3this PCT is not obligate and entirely dependent on groundwater. PCT 1395 is not restricted to locations of groundwater discharge or located within aquifers. PCT 1395 is likely to be on opportunistic facultative GDE that depends on the subsurface presence of groundwater in some locations but not in others, particularly where an alternative source of water (i.e. rainfall) cannot be accessed to maintain ecological function (Kuginis et al. 2016).

Direct impacts to these GDEs are not anticipated to occur as there are no GDEs located within the proposal site. There is not anticipated to be any appreciable change in groundwater flow or depth during construction of the proposal. It should also be noted that these GDEs are not entirely groundwater dependent and are more reliant on the collection of rainwater into associated waterways.

The proposal has the potential to result in indirect impacts to GDEs, however, any groundwater interference would be temporary and would be managed by the mitigation measures provided in chapter 7 of the REF. As such substantial impacts to GDEs are not expected.

5.2 Indirect and operational impacts

5.2.1 Edge effects on adjacent native vegetation and habitat

The proposal would have the potential to create new edge effects in previously undisturbed native vegetation. Considering the existing edge effects (section 0), the proposal would 'push back' current edge effected areas in the long-term as weeds colonise previously undisturbed areas.

5.2.2 Wildlife connectivity and habitat fragmentation

The primary connectivity corridor that occurs within the study area is that located within the riparian corridor of the Nepean River, which occurs in the southern extent of the study area. The majority of the vegetation within the study area is well connected both within the study area and to adjacent vegetation outside of the study area. Moderate to high quality vegetation occurs in the south and western extents of the study area, where the proposal approaches the Nepean River.

Vegetation outside of the study area is comprised of the same PCTs in similar condition classes (moderate-high) as those located within the study area. The well connected, moderate to high quality vegetation occurs in a linear band along the Nepean River Gorge in the south and west (Figure 3-1). To the east, impacts are restricted to primarily previously cleared areas containing minimal native vegetation. At the eastern extent of the study area, vegetation which is not proposed to be impacted is well connected to intact native vegetation associated with the Illawarra Escarpment.

Given the connectivity of vegetation through the study area and region, and the nature of the proposed works being removal of linear areas of vegetation adjacent to existing road infrastructure, the connectivity is considered to be maintained within the landscape and the proposed works are not expected to result in the fragmentation of habitat for any species.

With respect to Koala specifically, the CPCP Sub-plan B: Koalas (DPE 2022i) describes that a local population of Koala occurs within the surrounds of the study area. (i.e. all Koala which occur within the southern Sydney Koala Population). The vegetation within the study area associated with the Nepean River is also mapped under the CPCP (DPE 2022a) as a Koala habitat corridor and priority conservation land. This Sub-plan provides commitments to conserve Koala, which includes preserving connectivity. Road widening can result in increased barrier to dispersal for fauna species,. Picton Road and the M31 Hume Motorway are high speed roads with limits ranging from 80 to 110 kilometres per hour. This speed limit provides a significant collision risk for terrestrial, non-flying species, such as Koala. However, the Pheasants Nest bridge (located on the M31 Hume Motorway, over the Nepean River in the south of the study area) provides existing passage for fauna which may pass under these bridges. Fauna exclusion fencing is being erected prior to commencement of the proposed works, along heavily vegetated sections of Picton Road and the M31 Hume Motorway. The fencing is being completed as part of a separate project to assist in encouraging fauna movement through these existing safe passages. The fencing will remain in place where possible. If this fencing is required to be removed during construction, Transport will relocate this fencing, or utilise temporary fencing and replace as soon as practical. With the above in consideration, the project is considered to be consistent with the outcomes proposed in CPCP Sub-plan B: Koalas (DPE 2022i).

5.2.3 Injury and mortality

Given the widening of Picton Road proposed, and potential for increased development in the broader locality, it is anticipated that traffic volumes may increase upon operation. The proposal would introduce improvements in traffic safety, management and flow; however, given the road crossing distance would increase, there is a possibility of an increase to the risk of injury and mortality to susceptible fauna via vehicle strike.

Recommended mitigation measures for potential injury and mortality impacts are provided in chapter 6.

5.2.4 Invasion and spread of weeds

The proposal has the potential to spread weeds during vegetation removal and through the movement of vehicles and machinery into or out of the proposal site. Weeds can be easily transported as seeds and propagules on machinery brought to the proposal site. Equally, they can be carried away to other areas from the site or spread within it. If weeds are not controlled prior to work commencing, then there is the potential for spread throughout the site during and following construction. Priority weeds recorded within the study area are provided in section 3.4.

Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

5.2.5 Invasion and spread of pests, pathogens and disease

During construction, the proposal has the potential to cause both the spread of pathogens and diseases currently occurring in the study area and surrounds, and to introduce new biodiversity risks. This is particularly the case for fungus and diseases spread through the introduction and movement of soil. Standard pest hygiene management measures (listed below in section 6) during construction would minimise this risk.

The proposal also has the potential to increase the presence of exotic fauna species. Exotic fauna species recorded within the proposal site are provide in Appendix A.

5.2.6 Changes to hydrology

There would be some alteration to the existing surface hydrological conditions, however, this alteration is anticipated to be minor (surface level changes) such that the processes that are currently in place would largely remain.

Based on the current level of disturbance observed at each of the waterways within the study area, including erosion and habitat degradation from livestock usage, indirect impacts to Key Fish habitat which may result from the proposal are not expected to further decrease the quality of Key Fish Habitat mapped within the broader locality. As such, it is considered unlikely that the works would result in impacts to any of the above listed threatened species or to Key Fish Habitat.

Further information about potential impacts to hydrology is provided in section 6.5 of the REF.

Any small change to hydrology is unlikely to cause a substantial impact to the native vegetation and habitat present in the study area or surrounds post construction.

5.2.7 Noise, light, dust and vibration

Noise, light and vibration can disturb fauna, including threatened microbats that may be inhabiting nearby hollow-bearing trees or man-made structures. Temporary disturbance to wildlife from noise emissions and light spill during construction and night works are likely to be localised to within 50 to 100 metres of the proposal site and are not likely to have a significant long-term impact on wildlife that may occur within the study area or surrounding environment.

Nonetheless, mitigation measures to further reduce the potential impacts of any temporary impacts from noise and light pollution are recommended in section 6.

5.3 Cumulative impacts

Cumulative impacts are impacts that, when considered together, have different and/or greater impacts than a single impact on its own. Cumulative impacts can result from the successive, incremental and/or combined effects of a project when considered with other project/s. The extent to which another project would interact with the construction or operation of the proposal depends on its scale, location and/or timing of construction and/or operation. Generally, cumulative impacts would be expected to occur in situations where multiple long-duration construction activities are undertaken close to, and over a similar timescale to, construction activities for the proposal.

The proposal forms the western section of the broader Picton Road upgrade, which involves upgrading about 30 kilometres of Picton Road between the Nepean River and the M1 Princes Motorway. The current assessment forms part of the wider Picton Road upgrade and is the first proposal to commence. While biodiversity assessments have not been completed yet for subsequent proposals to understand their potential impacts, it is expected that there would be a cumulative biodiversity impact from the broader Picton Road Upgrade. Shared impacts from vegetation clearing and habitat loss would increase pressures on local communities and populations. The entire 30 kilometres upgrade has the potential to increase wildlife connectivity and roadkill impacts between the Nepean River and the M1 Princes Motorway. Development of mitigation by each proposal for such impacts may therefore need to consider broader pressures. As more information becomes available, each subsequent proposal would be able to assess the significance of the shared cumulative impacts to specific threatened entities to ensure the outcomes of these assessments remain valid and the broader impact of the program is understood. Cumulative impacts would also be expected to occur in situations where projects are operating at a similar scale and location to the proposal. However, the study area is within the Wilton Growth Area under the CPCP. The CPCP provides strategically assessed growth areas identifying urban capable land, which is suitable for development, and avoided land, which should be retained. Cumulative impacts through the region are expected to be consistent with the CPCP, occurring primarily in previously cleared areas and on land designated certified urban capable under the CPCP. Therefore, impacts as a result of development of the Wilton Growth Area are not expected to accumulate in the area for high quality habitat for threatened species and TECs.

5.4 Assessments of significance

BC Act ToS and EPBC Act SIC assessments were undertaken for all relevant threatened entities recorded or considered to have a moderate or higher likelihood of occurrence within the proposal site. These assessments are summarised in Table 5-4 and Table 5-5 respectively.

No FM Act 7-part tests were undertaken as threatened entities protected under the FM Act are at no risk of impact. A significant impact to any threatened entity is not considered likely. This conclusion was reached on the basis that impacts primarily occur in a linear nature, predominantly affecting the roadside edges of larger patches. Hence, while impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. This finding is supported by the effective implementation of the mitigation measures provided in chapter 6, primarily when considering impacts towards TECs.

With respect to the BC Act, the following is to be considered for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats:

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

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

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

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

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

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

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

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

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

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

Table 5-4: Summary of BC Act significance assessments findings

Significance assessment question *(per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))*						
Threatened species, or communities	a	b	c	d	e	Likely significant impact?
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	X	N	N	N	N	No
Cumberland Plain Woodland in the Sydney Basin Bioregion	X	N	N	N	N	No
Thick Lip Spider Orchid *Caladenia tessellata*	N	X	N	N	N	No
Sydney Plains Greenhood *Pterostylis saxicola*	N	X	N	N	N	No

Significance assessment question *(per Section 7.2 of the BC Act and Threatened Species Test of Significance Guidelines (OEH 2018))*						
Threatened species, or communities	a	b	c	d	e	Likely significant impact?
Matted Bush-Pea *Pultenaea pedunculata*	N	X	N	N	N	No
Hibbertia puberula	N	X	N	N	N	No
Austral Pillwort *Pilularia novae-hollandiae*	N	X	N	N	N	No
Little Lorikeet *Glossopsitta pusilla*	N	X	N	N	N	No
Eastern False Pipistrelle *Falsistrellus tasmaniensis*	N	X	N	N	N	No
Southern Myotis *Myotis macropus*	N	X	N	N	N	No
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	N	X	N	N	N	No
Greater Broad-nosed Bat *Scoteanax rueppellii*	N	X	N	N	N	No
Large-eared Pied Bat *Chalinolobus dwyeri*	N	X	N	N	N	No
Koala *Phascolarctos cinereus*	N	X	N	N	N	No
***Y** = Yes (negative impact), **N** = No (no or positive impact), **X** = Yes/No answer not applicable, **?** = unknown impact.*						

Table 5-5: Summary of EPBC Act significance assessments findings

Threatened species, or communities	Likely significant impact?
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	N
Shale Sandstone Transition Forest in the Sydney Basin Bioregion	N
Thick Lip Spider Orchid *Caladenia tessellata*	N
Sydney Plains Greenhood *Pterostylis saxicola*	N
Large-eared Pied Bat *Chalinolobus dwyeri*	N
Koala *Phascolarctos cinereus*	N
***Y** = Yes (negative impact), **N** = No (no or positive impact), **X** = Yes/No answer not applicable, **?** = unknown impact.*	

6. Mitigation

Mitigation measures recommended for the proposal are detailed in Table 6-1.

Table 6-1: Mitigation measures

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
B01	Removal of native vegetation	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a). If microbats are found present during pre-clearance surveys a, microbat management plan would be prepared.	Prior to construction	Effective	Up to 13.10 ha of native vegetation and TEC	Transport/Contractor
B02		Vegetation and habitat removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).	During construction	Effective	Up to 13.10 ha of native vegetation and TEC	Transport/Contractor
B03		Opportunities to replant disturbed areas (including areas within the proposal site identified for landscaping) will be defined by and undertaken in accordance with the Urban Design Strategy. The strategy will include: • Where possible and appropriate, use of native vegetation of local provenance (commensurate with PCTs 849 and 1395), in accordance with the recommended species planting provided in Appendix F. • Defining revegetation requirements in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a) and in consultation with a biodiversity specialist. • Identifying ongoing vegetation monitoring and maintenance requirements as needed.	Post construction	Effective	Up to 13.10 ha of native vegetation and TEC	Transport/Contractor
B04		Measures to minimise native vegetation and threatened species habitat removal within the proposal site will be investigated during detailed design and construction planning, and implemented where practicable and feasible.	Detailed design / pre-construction	Effective	Up to 13.10 ha of native vegetation and TEC	Contractor
B05	Removal of threatened fauna and flora habitat	Threatened fauna habitat removal will be minimised through detailed design.	Detailed design	Effective	Up to 13.10 ha native vegetation providing threatened fauna habitat.	Transport/Contractor
B06		A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's *Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects* (RTA 2011a) and implemented as part of the CEMP. It will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas.	During construction	Proven	Up to 13.10 ha of native vegetation and TEC	Transport/Contractor

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
		• Plans on fauna management (in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011a). • Requirements set out in the Landscape Guideline. • Pre-clearing survey requirements in accordance with *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). • Procedures for unexpected threatened species finds and fauna handling following *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). • Protocols to manage weeds, pathogens and pest species • Measures to manage potential light, noise and vibration impacts on threatened fauna.				
B07		Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock* and *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).	During construction	Proven	13.10 ha native vegetation providing threatened fauna habitat.	Transport/Contractor
B08	Aquatic impacts	Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a) and Section 3.3.2 *Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013).	During construction	Effective	Removal of riparian vegetation	Transport/Contractor
B09	Groundwater dependent ecosystems	Interruptions to water flows associated with groundwater dependent ecosystems will be minimised through detailed design.	Detailed design	Effective	Minimal, if any	Transport/Contractor
B10	Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design.	Detailed design	Effective	Minimal, if any	Transport/Contractor
B11	Edge effects on adjacent native	Exclusion zones will be set up at the limit of clearing in accordance *with Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). In addition and as previously mentioned, opportunities to replant disturbed areas (including areas within the proposal site identified for	Exclusion zones will be set up at the limit of clearing in	During construction	Effective	Not quantifiable

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
	vegetation and habitat	landscaping) will be defined by and undertaken in accordance with the Urban Design Strategy. This revegetation of degraded areas will create a buffer zone around edges to increase the size of the habitat and reduce edge effects.	accordance *with Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).			
B12	Invasion and spread of pathogens and disease	No pathogens or diseases were detected during field investigation. However, if any are recorded upon commencement of works, they will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).	During construction	Effective	Not quantifiable	Transport/Contractor
B13	Noise, light, dust and vibration	Artificial light impacts will be minimised through detailed design.	Detailed design	Effective	None	Transport
B14	Residual impacts to native flora and fauna (excluding certified land under the CPCP)	Additional targeted flora surveys in locations where previous surveys were unable to be completed. Species requiring survey and associated locations are displayed in section 3.7. Surveys will be completed to confirm the extent of habitat for these species and the total non-statutory offsets required for the proposal.	Detailed design	Effective	Not quantifiable	Transport/Contractor
B15		A biodiversity offset strategy will be developed and implemented to facilitate offsetting of impacts that exceed the thresholds within the *No Net Loss Guidelines* (Transport 2022a).	Prior to construction	Effective	None	Transport
B16		A tree inventory will be prepared by a qualified arborist to identify all trees within the approved clearing boundary and the proposed impacts to trees. This will include confirming the number of trees and hollows to be removed and replacement ratios in accordance with the tree and hollow replacement guidelines.	Detailed design	Effective	Not quantifiable	Transport/Contractor
B17		Prior to commencing vegetation clearing, a tree and hollow replacement plan will be developed to guide the approach to replacing trees and hollows in accordance with the *Tree and Hollow Replacement Guideline*s (Transport for NSW 2022b). This will include considering options for tree and hollow replacement within and in the vicinity of the proposal site in consultation with landowners.	Prior to construction	Effective	None	Transport

ID	Impact	Mitigation measure	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated?	Responsibility
		Where tree and hollow replacement cannot be accommodated locally or can only be partially accommodated, payment will be made to the Transport of NSW Conservation Fund prior to the commencement of works in accordance with the *Tree and Hollow Replacement Guidelines*.				

Certified Urban-capable Land

Section 3.3 of the CPCP infrastructure guidelines details the mitigation requirements for activities carried out under Part 5 of the EP&A Act, proposed on Certified – Urban Capable Land. These are reproduced below, with discussion and the appropriate mitigation measures from Table 6-1 noted. The suite of mitigation measures recommended for the proposal are considered to adequately address the requirements for Section 3.3 of the infrastructure guidelines.

Table 6-2 CPCP Mitigation Requirements for activities carried out on Certified - Urban Capable Land

Category	Mitigation requirements	Proposal consistency	Corresponding Transport Mitigation Measures
Threatened fauna	**Habitat features and connectivity** 1. Retain large trees that are greater than or equal to 50 cm diameter at breast height (including dead trees but excluding noxious weeds) where possible and apply tree protection measures for all vegetation to be retained. This is to provide ongoing roosting and foraging opportunities for fauna. 2. Retain areas of high density Proteaceae shrubs where possible, particularly along riparian corridors, to retain foraging resources, habitat and movement corridors for the Eastern Pygmy-possum. 3. Before any disturbance, all structures potentially providing habitat for microbats (bridges, culverts, mine shafts, storm water tunnels, old or derelict buildings) must be inspected by a qualified ecologist at an appropriate time of year. Where microbats are found, the structure providing habitat must not be affected, or a bat management plan must be prepared by a microbat specialist which allows for: ▪ exclusion mechanisms to reduce the risk of direct physical harm to the microbats; and/or ▪ supplementary habitat to compensate for lost habitat: and/or ▪ regular inspections of structures and briefing of relevant construction staff.	1. Large trees will be avoided and incorporated into landscaping areas where feasible. Clearing protocols, such as measure to protect vegetation to be retained would be in place in accordance with *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011b). 2. The study area is not known to contain high density Proteaceae species, with only a small abundance of *Grevillea* spp., and *Persoonia* spp. being present. The proposal would remove a small amount of these resources, however, targeted survey for Eastern Pygmy-possum did not detect the species. 3. Pre-clearing protocols and procedures would be in place in accordance with *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011b). If microbats are present a microbat management plan would be prepared.	B01 B05-B08

Category	Mitigation requirements	Proposal consistency	Corresponding Transport Mitigation Measures
	Pests 4. Before construction works begin, a pest control strategy must be prepared. This strategy must be implemented during construction and operation of the development. This strategy must include pest control methods that reduce the risk of secondary poisoning (for example, from Pindone or second-generation rodenticides).	4. No pests were identified during field investigations. Nonetheless given the general mobility of pest species (such as Rabbits or Foxes), their presence cannot be ruled out. A FFMP will be prepared in accordance with Transport for NSW's *Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects* (RTA 2011a) and implemented as part of the CEMP. This FFMP will include protocols to manage pest species, if identified.	B06
	Human disturbance 5. Before vegetation is removed, a suitably qualified ecologist must assess the site and do pre-clearance surveys for koalas. If Koalas are identified, implement a tree-felling protocol and translocation plan, as required. 6. For development within Koala habitat protected by the CPCP, a management plan must be developed and implemented which includes: ▪ before construction, temporary exclusion fencing to prevent Koalas entering the site measures to ensure the safety of Koalas during construction and operation of the infrastructure, including traffic calming measures ▪ hygiene procedures to prevent the spread of vegetation pathogens to Koala habitat trees. 7. Above-ground infrastructure must be set back from Grey-headed Flying-fox camps (minimum 100 m where possible) and raptor – bird of prey – nests (minimum 100 m where possible) at a suitable distance. Operational management measures to minimise disturbance to populations and nests must also be implemented. 8. Where existing Koala-exclusion fencing is located, works must ensure the integrity of the Koala-exclusion fencing is to be maintained. 9. Where linear infrastructure crosses identified Koala habitat, the infrastructure must be designed to ensure the functionality and connectivity of the corridor.	5. Pre-clearing surveys and felling supervision of habitat trees by a qualified ecologist would be undertaken in accordance with *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011b). 6. Fauna exclusion fencing is being erected by a separate Transport project prior to commencement of the proposed works, along heavily vegetated sections of Picton Road and the M31 Hume Motorway. The fencing would remain in place where possible. If this fencing is required to be removed for the proposed works, Transport would relocate this fencing, or utilise temporary fencing during construction and replace as soon as practical. Pathogens will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a). 7. At the time of writing, the study area is not known to contain Grey-headed Flying-fox camps or raptor nests, and is considered unlikely to do so in the future. Currently, this mitigation requirement is not applicable to the proposal. 8. see point 6 above. 9. As mentioned above, protected koala habitat mapping under the CPCP is present on the southern extent of the study area on the road verge of the M31 Hume Motorway. The motorway already exists as a barrier to Koala movement. Given there is already a barrier, the removal of a small linear patch (0.03 ha) is unlikely to further exacerbate the current level of connectivity to the surrounding area. Therefore, the level of integrity of	B01 B06 B16-B18

Category	Mitigation requirements	Proposal consistency	Corresponding Transport Mitigation Measures
		the connected habitat protected under the CPCP will remain the same post works.	
	Disease 10. Incorporate best-practice site hygiene protocols to manage the potential spread of pathogens, such as Phytophthora and myrtle rust adjacent to potential habitat for species targeted by the CPCP, including koala use trees from which koalas and the greater glider feed.	10. No pathogens or diseases were detected during field investigation. However, if any are recorded upon commencement of works, they will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).	B13
Threatened flora	**Weed Invasion** 11. Implement mitigation measures to manage weeds during construction and operation of the development, taking into account relevant guidance in the CPCP's Weed Control Implementation Strategy.	11. Weed species will be managed in accordance *with Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a)	B06 and B13
	Altered Fire Regime 12. Fire hazard management within asset protection zones is to be designed to protect existing *Pimelea spicata* individuals and be sympathetic to the ongoing recruitment of new individuals of this species to ensure its ongoing protection.	12. *Pimelea spicata* is not known to occur within the study area or in sufficient proximity such that recruitment of new individuals into the proposal site could realistically take place. Currently, this mitigation requirement is not applicable to the proposal.	N/A
Threatened Ecological Communities	**Habitat features and connectivity** 13. When works are likely to have indirect impacts on Cooks River/Castlereagh Ironbark Forest, undertake mitigation in accordance with best-practice guidelines within and adjacent to the TEC .	13. No Impacts are to occur to the Cooks River/Castlereagh Ironbark Forest. This mitigation requirement is not applicable to the proposal.	N/A
	Disease 14. Incorporate best-practice site hygiene protocols to manage the potential spread of pathogens, such as *Phytophthora* and myrtle rust adjacent to potential habitat for TECs.	14. No pathogens or diseases were detected during field investigation. However, if any are recorded upon commencement of works, they will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).	B13
Other protected matters	**Habitat features and connectivity** 15. Development adjacent to the southern and western boundaries of Commonwealth land comprising the Orchid Hills Defence Establishment must mitigate impacts on surface water flows and the water quality of Blaxland Creek.	15. Not applicable given the location of the proposal.	N/A

7. Offsets and other measures

This section considers whether any impacts require the provision of biodiversity offsets, conservation measures or tree and hollow replacement in accordance with the:

- *No Net Loss Guidelines* (Transport for NSW 2022a) and supporting resources.
- *Tree and Hollow Replacement Guidelines* (Transport for NSW 2022b) and supporting resources.

With respect to threatened flora and fauna, offset considerations are required for predicted species (ecosystem credit species), in addition to candidate species (species credit species). Ecosystem credit species are those that are assumed to occur based on the occurrence of the PCTs, habitat constraints, native vegetation cover in the landscape, and calculated patch sizes. Species credit species are species for which vegetation surrogates and/or landscape features cannot reliably predict the likelihood of their occurrence, or components of their habitat. Species credits, are in addition to ecosystem credits.

7.1 Thresholds

The thresholds set out by the *No Net Loss Guidelines* (Transport for NSW 2022a) are demonstrated below in Table 7-1. Further to this, an assessment of direct impacts to native vegetation and threatened species habitat against the below listed thresholds, along with the category of each threshold that has been triggered and the applicable threatened entity, are detailed in Table 7-2.

Offset requirements for the purposes of this BAR are generated using the BAM-C. Therefore, impact calculations used and imported into the BAM-C relate to impacts associated with BC Act listed entities only. Impact calculations used do not include areas mapped as certified under the CPCP

Impacts to threatened flora species were calculated for properties which were not surveyed during the correct survey period due to access constraints. Species requiring further survey and associated locations are displayed in section 3.7. These flora offsets can be avoided if surveys are undertaken on these properties prior to clearing, during the correct seasonal period for each species.

For the purpose of calculating offsets under the *No Net Loss Guidelines* (Transport for NSW 2022a) (and in accordance with Section 9.2.1 of the BAM), vegetation integrity scores have been used to separate vegetation in 'low condition' from higher condition areas (i.e. Moderate to good vegetation). Therefore, 'Moderate to good' vegetation includes vegetation zones that have a:

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

Table 7-1: Offset thresholds (Transport No Net Loss Guidelines)

Category	Impact	Threshold
A – Threatened Ecological Communities		
A1	Works involving clearing of a CEEC	Where there is any clearing of an CEEC in 'moderate to good' condition
A2	Works involving clearing of an EEC	Where clearing of a EEC ≥ 2 ha in 'moderate to good' condition
A3	Works involving clearing of VEC	Where clearing of VEC ≥ 5 ha in 'moderate to good' condition
B – Threatened fauna habitat		

B1	Works involving clearing of threatened fauna habitat that is also a TEC identified in Category A	No – covered by TEC thresholds
B2	Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species (excluding exotic and planted vegetation that cannot be assigned to a plant community type)	Where clearing ≥ 1 ha in 'moderate to good' condition
C- Threatened flora and habitat		
C1	Works involving removal of known threatened flora species and their habitat	Where loss of individuals is ≥ 10 (species that have a 'count of individuals' as the unit of measure) or where clearing of habitat (calculated by a species polygon in accordance with the BAM) is ≥ 1 ha
D – Key Fish Habitat		
D1	Type 1 or Type 2 key fish habitats	Where there is a net loss of habitat
Tree and Hollow Replacement		
	Any residual biodiversity impact that doesn't require offsets in accordance with the *No Net Loss Guidelines* (Transport for NSW 2022a) is to be assessed against the requirements of the Tree and Hollow Replacement Guideline.	Any clearing of hollows and/or trees ≥5cm DBH

Table 7-2: Assessment of vegetation impacts against thresholds

Veg. zone	Plant community type (PCT)	Condition	TEC	BC Act Impact (ha)	Threshold triggered?
Zone 1_849 Moderate	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate to good – VI score of 58.3	CEEC, BC Act and EPBC Act	2.78	A1 – CEEC B2 – Threatened Fauna
Zone 2_849 Scattered Trees	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Low condition – VI score of 2.5	CEEC, BC Act	0.02	B2 – Threatened Fauna
Zone 3_849 DNS	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate to good – VI score of 24.8.	CEEC, BC Act	0.39	A1 – CEEC

Zone 4_849 DNG	849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate to good condition – VI score of 28.3	CEEC, BC Act	0.45	A1 – CEEC
Zone 5_1181 High	1181: Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion	Moderate to good – VI score of 67.4	Not a TEC	N/A - No impact	N/A – No impact
Zone 6_1395 High	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Moderate to good – VI score of 80.4	CEEC, EPBC Act and BC Act	0.05	A1 – CEEC B2 – Threatened Fauna
Zone 7_1395 Moderate	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Moderate to good – VI score of 69.3	CEEC, EPBC Act and BC Act	1.36	A1 – CEEC B2 – Threatened Fauna
Zone 8_1395 Low	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Moderate to good – VI score of 58.3	CEEC, EPBC Act and BC Act	4.21	A1 – CEEC B2 – Threatened Fauna
Zone 9_1395 Scattered Trees	1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion	Low condition – VI score of 12.7	CEEC, BC Act	N/A - No impact	N/A – No impact
Zone 10_1395 DNS	1395: Narrow-leaved Ironbark - Broad-leaved	Low condition – VI score of 4.9	CEEC, BC Act	0.04	Tree and hollow replacement

	Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion				
Zone 11_877 High	877: Grey Myrtle dry rainforest of the Sydney Basin Bioregion and South East Corner Bioregion	Moderate to good – VI score of 99.8	Not TEC	N/A - No impact	N/A – No impact
UNE	Urban native/exotic and planted vegetation	Vegetation does not comprise a PCT assemblage known within the IBRA subregion.	Not a TEC	15.62	Tree and hollow replacement

7.2 Preliminary offset calculations

Preliminary calculations of offsets for each threshold category triggered above are provided below in Table 7-3 and Table 7-4. Calculations for impacts to ecosystem and species credit species have been completed using the BAM-C.

Table 7-3: Preliminary ecosystem credit calculations for impacts to threatened ecological communities

Plant community type	EPBC Act	BC Act	Ecosystem credits
849: *Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion*	Critically Endangered - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest	Critically Endangered - Cumberland Plain Woodland in the Sydney Basin Bioregion.	115
PCT 1395: *Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion*	Critically Endangered - Shale Sandstone Transition Forest in the Sydney Basin Bioregion	Critically Endangered - Shale Sandstone Transition Forest in the Sydney Basin Bioregion	215
Total ecosystem credits			**330**

Table 7-4: Preliminary credit calculations for impacts to species-credit species

Species name	EPBC Act	BC Act	Species credits
Koala	EN	EN	228
Large-eared Pied Bat	VU	VU	374
Southern Myotis	-	VU	237
Total species credits			**839**

7.3 Biodiversity offset strategy/tree and hollow replacement plan

As biodiversity offsetting thresholds would be reached under the *Not Net Loss Guidelines*, offsets or conservation measures would be required. In accordance with the *No Net Loss Guidelines*, a detailed biodiversity offset strategy would be developed to outline how the proposal would address the offsetting requirements of these residual impacts.

For impacts to vegetation that would not otherwise be offset via the biodiversity offset strategy and biodiversity offsetting thresholds have not been reached under the *No Net Loss Guidelines* (Transport for NSW 2022a), offsets or conservation measures are not required. However, the *Tree and Hollow Replacement Guidelines* do apply (Transport for NSW 2022b).

The following vegetation zones meet the criteria under the *Tree and Hollow Replacement Guidelines*:

- Zone 10_1395 DNS
- Urban native/exotic

Of the above, one zone is present in a DNS condition state. This condition class does not contain any hollows or trees with a DBH greater than five centimetres. Therefore, no further considerations are required for this zone.

The number of trees and hollows to be offset in each of the remaining zones has been estimated from data collected in BAM plots. The tree size data is collected within the 0.1ha BAM plot (function plot) and the average number of each of the offset tree size categories was calculated. The data was then extrapolated across the total area for each vegetation zone, to estimate the number of trees to be removed. The estimated number of trees for each size category and number of trees to be planted as a result of the removal of these is provided in Table 7-5.

Prior to clearing, a pre-clearance survey would be undertaken to identify the actual number of trees requiring offsetting within each category. A tree and hollow replacement plan would then prepare to address the impacts prior to the commencement of works. Where tree and hollow replacement cannot be accommodated locally or can only be partially accommodated, payment would be made to the Transport of NSW Conservation Fund prior to the commencement of works in accordance with the *Tree and Hollow Replacement Guidelines*.

Table 7-5: Estimated number of trees and hollows requiring replacement

Tree category	Tree replacement requirement	Estimated average number of trees	Number of trees to plant
Urban native/exotic			
Very large tree (DBH_2 greater than 100cm)	Plant minimum 16 trees	-	-
Large tree (DBH between 50cm and 100cm)	Plant minimum eight trees	31	123
Medium tree (DBH greater than 20 cm, but less than 50cm)	Plant minimum four trees	62	123
Small tree (DBH greater than 5cm, but less than 20cm)	Plant minimum two trees	77	153
Hollow replacement requirement	Provide three artificial hollows for every occupied hollow removed.	-	-
Total estimated trees to plant for offsets			**399**

8. Conclusion

This BAR provides an assessment of the potential impacts of the proposal on ecological values in accordance with the EP&A Act, BC Act, the EPBC Act and the BAM. The study area was found to contain a range of biodiversity values including:

- Two BC Act and EPBC Act listed TECs:
    - PCT 849: BC Act, CEEC - Cumberland Plain Woodland in the Sydney Basin Bioregion. EPBC Act, CEEC - Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
        - PCT 1395: BC Act, CEEC - Shale Sandstone Transition Forest in the Sydney Basin Bioregion. EPBC Act, CEEC - Shale Sandstone Transition Forest in the Sydney Basin Bioregion
- Threatened flora habitat for:
    - Thick Lip Spider Orchid *Caladenia tessellata*
    - Sydney Plains Greenhood *Pterostylis saxicola*
    - Matted Bush-Pea *Pultenaea pedunculata*
    - *Hibbertia puberula*
    - Austral Pillwort *Pilularia novae-hollandiae*
- Threatened fauna habitat for:
    - Little Lorikeet *Glossopsitta pusilla*
    - Little Bent-winged Bat *Miniopterus australis*
    - Large Bent-winged Bat *Miniopterus orianae oceanensis*
    - Eastern False Pipistrelle *Falsistrellus tasmaniensis*
    - Eastern Coastal Free-tailed Bat Micronomus norfolkensis
    - Southern Myotis *Myotis macropus*
    - Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*
    - Greater Broad-nosed Bat *Scoteanax rueppellii*
    - Grey-headed Flying-Fox *Pteropus poliocephalus*
    - Large-eared Pied Bat *Chalinolobus dwyeri*
    - Masked Owl *Tyto novaehollandiae*
    - Koala *Phascolarctos cinereus*

Following efforts to avoid and minimise, the proposal would result in the following residual impacts to native vegetation (excluding areas listed as Certified-urban capable under the CPCP) as well as NSW and nationally listed biodiversity values:

- Clearing of up to 13.10 ha of the following native vegetation (note the same patch of vegetation may represent one or both of a BC Act and an EPBC Act TEC, each with different total areas impacted):
    - 3.64 ha of PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC (Cumberland Plain Woodland) under the BC Act
    - 4.01 ha of PCT 849: Grey Box - Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC (Cumberland Plain Woodland) under the EPBC Act
    - 5.67 ha of PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC under the BC Act
    - 6.59 ha of PCT 1395: Narrow-leaved Ironbark - Broad-leaved Ironbark - Grey Gum open forest of the edges of the Cumberland Plain, Sydney Basin Bioregion, listed as a CEEC under the EPBC Act

The proposal would result int following impacts on threatened flora and fauna habitat:

- Impacts towards the following threatened flora and fauna:

- Threatened flora:
    - Thick Lip Spider Orchid *Caladenia tessellata* (0.53 ha)
    - Sydney Plains Greenhood *Pterostylis saxicola* (0.53 ha)
    - Matted Bush-Pea *Pultenaea pedunculata* (0.52 ha)
    - *Hibbertia puberula* (0.52 ha)
    - Austral Pillwort *Pilularia novae-hollandiae* (0.52 ha)
- Threatened fauna:
    - Little Lorikeet *Glossopsitta pusilla* (8.40ha)
    - Large-eared Pied Bat *Chalinolobus dwyeri* (8.27 ha)
    - Eastern Coastal Free-tailed Bat *Micronomus norfolkensis* (8.40 ha)
    - Eastern False Pipistrelle *Falsistrellus tasmaniensis* (8.40 ha)
    - Southern Myotis *Myotis macropus* (7.84 ha)
    - Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (8.40ha)
    - Greater Broad-nosed Bat *Scoteanax rueppellii* (8.40 ha)
    - Koala *Phascolarctos cinereus* (7.52 ha)

In accordance with Transports *No Net Loss Guidelines* (Transport for NSW 2022a), the proposal would trigger the consideration of offsets or conservation measures to offset impacts to the PCTs/TECs detailed in section 7. Outside of the areas, the *Tree and Hollow Replacement Guidelines* (Transport for NSW 2022b) apply and a Tree and Hollow Replacement Plan is required to be developed or payment made into the Transport Conservation Fund.

ToS and SIC assessments were undertaken for threatened species and ecological communities either recorded or considered as having a moderate or higher likelihood of occurring. These assessments concluded that the proposal is unlikely to have a significant impact on any NSW or Commonwealth listed entity. It is important to note that the removal is not substantial when considering the broader context. Impacts would also be offset via the *No Net Loss Guidelines* (Transport for NSW 2022a) and Tree and Hollow Replacement Guidelines (Transport for NSW 2022b), which incorporates the consideration of non-statutory offsets under the BAM-C for impacts to PCTs and BAM species credit species determined to be impacted by the proposal. Further to this, opportunities to replant disturbed areas (including areas within the proposal site identified for landscaping) are recommended to be defined by and undertaken in accordance with the Urban Design Strategy. This strategy would incorporate (where possible and appropriate) the use of native species typical of with TECs being impacted.

Through the application of specific and measurable mitigation measures proven effective on similar proposals, it is also anticipated that the level of impact to threatened fauna and flora would continue to be reduced from the levels assessed in this BAR. Therefore, Transport is not required to prepare a SIS or BDAR for the proposal.

Mitigation measures specific to the removal of threatened and general fauna species habitat have been included in section 6 of this report, which primarily covers mitigation measures listed in the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a). The successful execution of the precautionary measures and mitigation strategies recommended in this BAR can effectively alleviate the risks of adverse effects on biodiversity to a level that is deemed satisfactory.

With the effective implementation of the recommended safeguards and mitigation measures, the risk of impacts to biodiversity can be mitigated to an acceptable level.

9. Glossary

Term	Definition
Accredited person or assessor	Means as person accredited under Section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under Section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity Assessment Method Calculator	Biodiversity Assessment Method Calculator (BAM-C) – the online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site. It is published by the Department (DPIE 2020a).
Biodiversity credit report	The report produced by the BAM-C that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (DPIE 2020a).
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020a).
Biodiversity Stewardship site	Refers to land which is the subject to a Biodiversity Stewardship Agreement under the BC Act.
BioNet Atlas	The DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish (DPIE 2020a).
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. Refer About BioNet Vegetation Classification | NSW Environment and Heritage (DPE 2020a).
Proposal site	The area to be directly impacted by the proposal during construction activities. See also definition for proposal site.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020a).
Ecosystem credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for ecosystem credits. This is analogous with the definition of 'predicted species'.

Ecosystem credits	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site (DPIE 2020a).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (DPIE 2020a).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the proposal site or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020a).
Landscape assessment area	The area which includes the proposal site and a 1500 m buffer surrounding the outside edge of the boundary of the proposal site or 500 m along each side of the centre line of a linear-shaped proposal
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • *The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area.* • *The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area.* • *The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year (OEH 2018).*
Matter of national environmental significance	A matter of national environmental significance (MNES) is any of the nine defined components protected by a provision of Part 3 of the EPBC Act (Commonwealth).
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in Section 1.6 of the BC Act and Section 60B of the LLS Act. In summary, 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. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020a).
Patch size	An area of native vegetation that: • *occurs on the development site or biodiversity stewardship site*

	• *includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems).* Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (DPIE 2020a).
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).
Spatial datasets	Spatial databases required to prepare a BAR • *BioNet NSW (Mitchell) Landscapes – Version 3.1* • *NSW Interim Biogeographic Regions of Australia (IBRA region and sub-regions) – Version 7* • *NSW soil profiles* • *hydrogeological landscapes* • *acid sulfate soils risk* • *digital cadastral database* • *Vegetation Information Systems maps* • *Geological sites of NSW.*
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (DPIE 2020a). This is analogous with the definition of 'candidate species'.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (DPIE 2020a).
Species polygon	An area of land identified in Chapter 5 (of the BAM) that contains habitat or is occupied by a threatened species (DPIE 2020a).
Study area	The area directly affected by the proposal (proposal site) and any additional areas with the potential to be affected by the proposal, either directly or indirectly.
Proposal site	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the proposal site (i.e., the area of land in the 1500 m buffer zone around the proposal site or 500m buffer zone for linear proposals). In the case of a biodiversity certification proposal, proposal site includes the biodiversity certification assessment area (DPIE 2020a). See also definition for proposal site.
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (DPIE 2020a).
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (DPIE 2020a).

10. Abbreviations

Term	Definition
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAR	Biodiversity Assessment Report
BAM-C	Biodiversity Assessment Method calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPE	Department of Planning and Environment
DPI	Department of Primary Industries
DPI Fisheries	Department of Primary Industries - Fisheries
EEC	Endangered ecological community
EHG	NSW Environment and Heritage Group within the Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	*Environment Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
Fisheries NSW Policy and guidelines	Fisheries NSW Policy and guidelines for fish habitat conservation and management (Update 2013)
FM Act	Fisheries Management Act 1994 (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of national environmental significance
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SAII	Serious and Irreversible Impacts
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (VECs, EECs and CEECs)
Transport	Transport for NSW

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Appendix A: Species recorded

Recorded flora

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Acanthaceae	*Brunoniella australis*	Blue Trumpet	-	-	Plot data
Adiantaceae	*Cheilanthes sieberi*	Rock Fern	-	-	Plot data
Adiantaceae	*Cheilanthes sieberi* subsp. *sieberi*	Rock Fern	-	-	Plot data
Amaranthaceae	*Alternanthera pungens*	Khaki Weed	-	-	Plot data
Anthericaceae	*Laxmannia gracilis*	Slender Wire Lily	-	-	Plot data
Anthericaceae	*Tricoryne elatior*	Yellow Autumn-lily	-	-	Plot data
Apocynaceae	*Araujia sericifera*	Moth Vine	-	-	Plot data
Apocynaceae	*Gomphocarpus fruticosus*	Narrow-leaved Cotton Bush	-	-	Plot data
Araliaceae	*Astrotricha latifolia*	*Astrotricha latifolia*	-	-	Plot data
Asparagaceae	*Asparagus asparagoides*	Bridal Creeper	-	-	Plot data
Asteraceae	*Aster subulatus*	Wild Aster	-	-	Plot data
Asteraceae	*Bidens pilosa*	Cobbler's Pegs	-	-	Plot data
Asteraceae	*Calotis cuneata*	Mountain Burr-Daisy	-	-	Plot data
Asteraceae	*Calotis dentex*	Burr-daisy	-	-	Plot data
Asteraceae	*Cassinia aculeata*	Dolly Bush	-	-	Plot data
Asteraceae	*Cirsium vulgare*	Spear Thistle	-	-	Plot data
Asteraceae	*Cirsium vulgare*	Spear Thistle	-	-	Incidental
Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	-	-	Plot data
Asteraceae	*Conyza sumatrensis*	Tall fleabane	-	-	Plot data
Asteraceae	*Cotula australis*	Common Cotula	-	-	Plot data
Asteraceae	*Cymbonotus lawsonianus*	Bear's Ear	-	-	Plot data
Asteraceae	*Euchiton japonicus*	*Euchiton japonicus*	-	-	Plot data
Asteraceae	*Euchiton sphaericus*	Star Cudweed	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Asteraceae	*Facelis retusa*	*Facelis retusa*	-	-	Plot data
Asteraceae	*Gamochaeta americana*	Cudweed	-	-	Plot data
Asteraceae	*Gamochaeta calviceps*	Cudweed	-	-	Plot data
Asteraceae	*Gamochaeta purpurea*	Purple Cudweed	-	-	Plot data
Asteraceae	*Hypochaeris glabra*	Smooth Catsear	-	-	Plot data
Asteraceae	*Hypochaeris radicata*	Catsear	-	-	Plot data
Asteraceae	*Lactuca serriola*	Prickly Lettuce	-	-	Plot data
Asteraceae	*Lagenophora gracilis*	Slender Lagenophora	-	-	Plot data
Asteraceae	*Olearia viscidula*	Wallaby Weed	-	-	Plot data
Asteraceae	*Ozothamnus diosmifolius*	White Dogwood	-	-	Plot data
Asteraceae	*Senecio madagascariensis*	Fireweed	-	-	Plot data
Asteraceae	*Solenogyne bellioides*	Solengyne	-	-	Plot data
Asteraceae	*Sonchus asper*	Prickly Sowthistle	-	-	Plot data
Asteraceae	*Sonchus oleraceus*	Common Sowthistle	-	-	Plot data
Asteraceae	*Tagetes minuta*	Stinking Roger	-	-	Plot data
Asteraceae	*Taraxacum officinale*	Dandelion	-	-	Plot data
Asteraceae	*Vernonia cinerea*	*Vernonia cinerea*	-	-	Plot data
Asteraceae	*Vittadinia cuneata*	Fuzzweed	-	-	Plot data
Brassicaceae	*Brassica fruticulosa*	Brassica fruticulosa	-	-	Plot data
Campanulaceae	*Lobelia purpurascens*	White Root	-	-	Plot data
Campanulaceae	*Wahlenbergia gracilis*	Bluebell	-	-	Plot data
Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed	-	-	Plot data
Caryophyllaceae	*Stellaria media*	Common Chickweed	-	-	Plot data
Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak	-	-	Plot data
Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak	-	-	Incidental
Casuarinaceae	*Casuarina cunninghamiana* subsp. *cunninghamiana*	*Casuarina cunninghamiana* subsp. *Cunninghamiana*	-	-	Plot data
Casuarinaceae	*Casuarina glauca*	Swamp Oak	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Chenopodiaceae	*Einadia hastata*	Berry Saltbush	-	-	Plot data
Chenopodiaceae	*Einadia polygonoides*	Knotweed Goosefoot	-	-	Plot data
Clusiaceae	*Hypericum gramineum*	Small St John's Wort	-	-	Plot data
Clusiaceae	*Hypericum perforatum*	St. Johns Wort	-	-	Plot data
Commelinaceae	*Commelina cyanea*	Native Wandering Jew	-	-	Plot data
Convolvulaceae	*Dichondra repens*	Kidney Weed	-	-	Plot data
Convolvulaceae	*Dichondra repens*	Kidney Weed	-	-	Incidental
Cupressaceae	*Callitris rhomboidea*	Port Jackson Pine	-	-	Plot data
Cyperaceae	*Carex breviculmis*	*Carex breviculmis*	-	-	Plot data
Cyperaceae	*Carex inversa*	Knob Sedge	-	-	Plot data
Cyperaceae	*Cyathochaeta diandra*	*Cyathochaeta diandra*	-	-	Plot data
Cyperaceae	*Cyperus brevifolius*	*Cyperus brevifolius*	-	-	Plot data
Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge	-	-	Plot data
Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	-	-	Plot data
Cyperaceae	*Fimbristylis dichotoma*	Common Fringe-sedge	-	-	Plot data
Cyperaceae	*Gahnia aspera*	Rough Saw-sedge	-	-	Plot data
Cyperaceae	*Lepidosperma latens*	*Lepidosperma latens*	-	-	Plot data
Cyperaceae	*Lepidosperma laterale*	Variable Sword-sedge	-	-	Plot data
Cyperaceae	*Schoenus apogon*	Fluke Bogrush	-	-	Plot data
Cyperaceae	*Schoenus imberbis*	*Schoenus imberbis*	-	-	Plot data
Cyperaceae	*Schoenus melanostachys*	*Schoenus melanostachys*	-	-	Incidental
Dilleniaceae	*Hibbertia aspera*	Rough Guinea Flower	-	-	Plot data
Dilleniaceae	*Hibbertia circumdans*	*Hibbertia circumdans*	-	-	Plot data
Dilleniaceae	*Hibbertia diffusa*	Wedge Guinea Flower	-	-	Plot data
Dilleniaceae	*Hibbertia empetrifolia*	*Hibbertia empetrifolia*	-	-	Plot data
Elaeocarpaceae	*Elaeocarpus reticulatus*	Blueberry Ash	-	-	Incidental
Ericaceae	*Astroloma humifusum*	Native Cranberry	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Ericaceae	*Leucopogon juniperinus*	Prickly Beard-heath	-	-	Plot data
Ericaceae	*Lissanthe strigosa* subsp. *subulata*	Peach Heath	-	-	Plot data
Euphorbiaceae	*Bertya pomaderroides*	*Bertya pomaderroides*	-	-	Plot data
Euphorbiaceae	*Beyeria viscosa*	Sticky Wallaby Bush	-	-	Plot data
Fabaceae	*Acacia decurrens*	Black Wattle	-	-	Plot data
Fabaceae	*Acacia linifolia*	White Wattle	-	-	Plot data
Fabaceae	*Acacia paradoxa*	Kangaroo Thorn	-	-	Plot data
Fabaceae	*Acacia parramattensis*	Parramatta Wattlre	-	-	Plot data
Fabaceae	*Acacia terminalis*	Sunshine Wattle	-	-	Plot data
Fabaceae	*Acacia ulicifolia*	Prickly Moses	-	-	Plot data
Fabaceae	*Bossiaea heterophylla*	Variable Bossiaea	-	-	Plot data
Fabaceae	*Bossiaea prostrata*	*Bossiaea prostrata*	-	-	Plot data
Fabaceae	*Daviesia ulicifolia*	Gorse Bitter Pea	-	-	Plot data
Fabaceae	*Desmodium brachypodum*	Large Tick-trefoil	-	-	Plot data
Fabaceae	*Desmodium varians*	Slender Tick-trefoil	-	-	Plot data
Fabaceae	*Dillwynia trichopoda*	*Dillwynia trichopoda*	-	-	Plot data
Fabaceae	*Glycine clandestina*	Twining glycine	-	-	Plot data
Fabaceae	*Glycine microphylla*	Small-leaf Glycine	-	-	Plot data
Fabaceae	*Glycine tabacina*	Variable Glycine	-	-	Plot data
Fabaceae	*Gompholobium inconspicuum*	*Gompholobium inconspicuum*	-	-	Plot data
Fabaceae	*Hardenbergia violacea*	False Sarsaparilla	-	-	Plot data
Fabaceae	*Hovea linearis*	*Hovea linearis*	-	-	Plot data
Fabaceae	*Indigofera australis*	Australian Indigo	-	-	Plot data
Fabaceae	*Lotus angustissimus*	Slender Birds-foot Trefoil	-	-	Plot data
Fabaceae	*Medicago laciniata*	Cut-leaved Medic	-	-	Plot data
Fabaceae	*Trifolium campestre*	Hop Clover	-	-	Plot data
Fabaceae	*Trifolium dubium*	Yellow Suckling Clover	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Fabaceae	*Trifolium glomeratum*	Clustered Clover	-	-	Plot data
Fabaceae	*Trifolium repens*	White Clover	-	-	Plot data
Fabaceae	*Zornia dyctiophylla*	Zornia	-	-	Plot data
Gentianaceae	*Centaurium erythraea*	Common Centaury	-	-	Plot data
Gentianaceae	*Centaurium tenuiflorum*	Branched Centaury, Slender centaury	-	-	Plot data
Geraniaceae	*Geranium neglectum*	Geranium neglectum	-	-	Plot data
Geraniaceae	*Geranium solanderi*	Native Geranium	-	-	Plot data
Goodeniaceae	*Brunonia australis*	Blue Pincushion	-	-	Plot data
Goodeniaceae	*Coopernookia barbata*	Purple Goodenia	-	-	Plot data
Goodeniaceae	*Dampiera purpurea*	*Dampiera purpurea*	-	-	Plot data
Goodeniaceae	*Goodenia hederacea*	Ivy Goodenia	-	-	Plot data
Haloragaceae	*Gonocarpus tetragynus*	Poverty Raspwort	-	-	Plot data
Hypoxidaceae	*Hypoxis hygrometrica*	Golden Weather-grass	-	-	Plot data
Iridaceae	*Sisyrinchium rosulatum*	Scourweed	-	-	Plot data
Juncaceae	*Juncus filicaulis*	*Juncus filicaulis*	-	-	Plot data
Juncaceae	*Juncus usitatus*	*Juncus usitatus*	-	-	Plot data
Lamiaceae	*Westringia longifolia*	Long-leaved Westringia	-	-	Plot data
Lauraceae	*Cassytha glabella*	*Cassytha glabella*	-	-	Plot data
Linaceae	*Linum trigynum*	French Flax	-	-	Plot data
Loganiaceae	*Mitrasacme polymorpha*	*Mitrasacme polymorpha*	-	-	Plot data
Lomandraceae	*Lomandra confertifolia* subsp. *rubiginosa*	*Lomandra confertifolia* subsp. *rubiginosa*	-	-	Plot data
Lomandraceae	*Lomandra filiformis* subsp. *coriacea*	Wattle Matt-rush	-	-	Plot data
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	*Lomandra filiformis* subsp. *filiformis*	-	-	Plot data
Lomandraceae	*Lomandra longifolia*	Spiny-headed Mat-rush	-	-	Plot data
Lomandraceae	*Lomandra multiflora* subsp. *multiflora*	Many-flowered Mat-rush	-	-	Plot data
Lomandraceae	*Lomandra obliqua*	*Lomandra obliqua*	-	-	Plot data
Lythraceae	*Lythrum hyssopifolia*	Hyssop Loosestrife	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Malaceae	*Cotoneaster glaucophyllus*	Cotoneaster glaucophyllus	-	-	Plot data
Malvaceae	*Modiola caroliniana*	Red-flowered Mallow	-	-	Plot data
Malvaceae	*Pavonia hastata*	*Pavonia hastata*	-	-	Plot data
Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	-	-	Plot data
Myrtaceae	*Angophora bakeri*	Narrow-leaved Apple	-	-	Plot data
Myrtaceae	*Angophora bakeri*	Narrow-leaved Apple	-	-	Incidental
Myrtaceae	*Eucalyptus amplifolia*	Eucalyptus amplifolia	-	-	Plot data
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	-	-	Plot data
Myrtaceae	*Eucalyptus crebra*	Narrow-leaved Ironbark	-	-	Incidental
Myrtaceae	*Eucalyptus eugenioides*	Thin-leaved Stringybark	-	-	Plot data
Myrtaceae	*Eucalyptus eugenioides*	Thin-leaved Stringybark	-	-	Incidental
Myrtaceae	*Eucalyptus fibrosa*	Red Ironbark	-	-	Plot data
Myrtaceae	*Eucalyptus piperita*	Sydney Peppermint	-	-	Incidental
Myrtaceae	*Eucalyptus punctata*	Grey Gum	-	-	Plot data
Myrtaceae	*Eucalyptus punctata*	Grey Gum	-	-	Incidental
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	-	-	Plot data
Myrtaceae	*Eucalyptus tereticornis*	Forest Red Gum	-	-	Incidental
Myrtaceae	*Kunzea ambigua*	Tick Bush	-	-	Plot data
Myrtaceae	*Kunzea ambigua*	Tick Bush	-	-	Incidental
Myrtaceae	*Leptospermum polygalifolium*	Tantoon	-	-	Plot data
Oleaceae	*Notelaea longifolia*	Large Mock-olive	-	-	Plot data
Oleaceae	*Olea europaea* subsp. *cuspidata*	African Olive	-	-	Plot data
Orchidaceae	*Acianthus fornicatus*	Pixie Caps	-	-	Plot data
Orchidaceae	*Calochilus* sp. aff. *gracillimus*	*Calochilus* sp. aff. *gracillimus*	-	-	Plot data
Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis	-	-	Plot data
Oxalidaceae	*Oxalis exilis*	*Oxalis exilis*	-	-	Plot data
Oxalidaceae	*Oxalis perennans*	*Oxalis perennans*	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Phyllanthaceae	*Phyllanthus hirtellus*	Thyme Spurge	-	-	Plot data
Phyllanthaceae	*Phyllanthus virgatus*	Wiry Spurge	-	-	Plot data
Phyllanthaceae	*Poranthera corymbosa*	*Poranthera corymbosa*	-	-	Plot data
Phyllanthaceae	*Poranthera microphylla*	Small Poranthera	-	-	Plot data
Phytolaccaceae	*Phytolacca octandra*	Inkweed	-	-	Plot data
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry	-	-	Plot data
Pittosporaceae	*Bursaria spinosa*	Native Blackthorn	-	-	Plot data
Pittosporaceae	*Bursaria spinosa*	Native Blackthorn	-	-	Incidental
Plantaginaceae	*Plantago debilis*	Shade Plantain	-	-	Plot data
Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	-	-	Plot data
Plantaginaceae	*Veronica plebeia*	Trailing Speedwell	-	-	Plot data
Poaceae	*Andropogon virginicus*	Whisky Grass	-	-	Plot data
Poaceae	*Aristida ramosa*	Purple Wiregrass	-	-	Plot data
Poaceae	*Aristida vagans*	Threeawn Speargrass	-	-	Plot data
Poaceae	*Austrostipa pubescens*	*Austrostipa pubescens*	-	-	Plot data
Poaceae	*Austrostipa rudis*	*Austrostipa rudis*	-	-	Plot data
Poaceae	*Austrostipa rudis* subsp. *nervosa*	Spear Grass	-	-	Plot data
Poaceae	*Austrostipa setacea*	Corkscrew Grass	-	-	Plot data
Poaceae	*Austrostipa verticillata*	Slender Bamboo Grass	-	-	Plot data
Poaceae	*Avena barbata*	Bearded Oats	-	-	Plot data
Poaceae	*Axonopus fissifolius*	Narrow-leafed Carpet Grass	-	-	Plot data
Poaceae	*Bothriochloa decipiens var. decipiens*	Pitted Bluegrass	-	-	Plot data
Poaceae	*Bothriochloa macra*	Red Grass	-	-	Plot data
Poaceae	*Briza minor*	Shivery Grass	-	-	Plot data
Poaceae	*Briza subaristata*	*Briza subaristata*	-	-	Plot data
Poaceae	*Bromus catharticus*	Praire Grass	-	-	Plot data
Poaceae	*Cenchrus clandestinus*	Kikuyu Grass	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Poaceae	*Chloris gayana*	Rhodes Grass	-	-	Plot data
Poaceae	*Chloris ventricosa*	Tall Chloris	-	-	Plot data
Poaceae	*Cleistochloa rigida*	*Cleistochloa rigida*	-	-	Plot data
Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	-	-	Plot data
Poaceae	*Cynodon dactylon*	Common Couch	-	-	Plot data
Poaceae	*Dactylis glomerata*	Cocksfoot	-	-	Plot data
Poaceae	*Dichelachne crinita*	Longhair Plumegrass	-	-	Plot data
Poaceae	*Dichelachne micrantha*	Shorthair Plumegrass	-	-	Plot data
Poaceae	*Dichelachne parva*	*Dichelachne parva*	-	-	Plot data
Poaceae	*Digitaria brownii*	Cotton Panic Grass	-	-	Plot data
Poaceae	*Digitaria parviflora*	Small-flowered Finger Grass	-	-	Plot data
Poaceae	*Digitaria sanguinalis*	Crab Grass	-	-	Plot data
Poaceae	*Echinopogon caespitosus*	Bushy Hedgehog-grass	-	-	Plot data
Poaceae	*Ehrharta erecta*	Panic Veldtgrass	-	-	Plot data
Poaceae	*Eleusine tristachya*	Goose Grass	-	-	Plot data
Poaceae	*Entolasia marginata*	Bordered Panic	-	-	Plot data
Poaceae	*Entolasia stricta*	Wiry Panic	-	-	Plot data
Poaceae	*Entolasia stricta*	Wiry Panic	-	-	Incidental
Poaceae	*Eragrostis brownii*	Brown's Lovegrass	-	-	Plot data
Poaceae	*Eragrostis curvula*	African Lovegrass	-	-	Plot data
Poaceae	*Eragrostis leptocarpa*	Drooping Lovegrass	-	-	Plot data
Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	-	-	Plot data
Poaceae	*Eragrostis leptostachya*	Drooping Lovegrass	-	-	Plot data
Poaceae	*Holcus lanatus*	Yorkshire Fog	-	-	Plot data
Poaceae	*Lepidosperma laterale*	Variable Sword-sedge	-	-	Incidental
Poaceae	*Lolium perenne*	Perennial Ryegrass	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Poaceae	*Megathyrsus maximus*	*Megathyrsus maximus*	-	-	Plot data
Poaceae	*Microlaena stipoides*	Weeping Grass	-	-	Plot data
Poaceae	*Microlaena stipoides*	Weeping Grass	-	-	Incidental
Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Grass	-	-	Plot data
Poaceae	*Nassella neesiana*	Chilean Needle Grass	-	-	Plot data
Poaceae	*Panicum effusum*	Hairy Panic	-	-	Plot data
Poaceae	*Panicum simile*	Two-colour Panic	-	-	Plot data
Poaceae	*Paspalidium distans*	*Paspalidium distans*	-	-	Plot data
Poaceae	*Paspalum dilatatum*	Paspalum	-	-	Plot data
Poaceae	*Pennisetum clandestinum*	Kikuyu Grass	-	-	Plot data
Poaceae	*Phalaris aquatica*	Phalaris	-	-	Plot data
Poaceae	*Poa labillardierei* var. *labillardierei*	Tussock	-	-	Plot data
Poaceae	*Rytidosperma longifolium*	Long-leaved Wallaby Grass	-	-	Plot data
Poaceae	*Rytidosperma tenuius*	A Wallaby Grass	-	-	Plot data
Poaceae	*Setaria parviflora*	*Setaria parviflora*	-	-	Plot data
Poaceae	*Setaria pumila*	Pale Pigeon Grass	-	-	Plot data
Poaceae	*Setaria pumila*	Pale Pigeon Grass	-	-	Incidental
Poaceae	*Sporobolus africanus*	Parramatta Grass	-	-	Plot data
Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass	-	-	Plot data
Poaceae	*Sporobolus fertilis*	Giant Parramatta Grass	-	-	Plot data
Poaceae	*Themeda triandra*	*Themeda triandra*	-	-	Plot data
Polygalaceae	*Polygala virgata*	*Polygala virgata*	-	-	Plot data
Polygonaceae	*Rumex brownii*	Swamp Dock	-	-	Plot data
Polygonaceae	*Rumex crispus*	Curled Dock	-	-	Plot data
Polygonaceae	*Rumex pulcher*	Rumex pulcher	-	-	Plot data
Portulacaceae	*Calandrinia pickeringii*	*Calandrinia pickeringii*	-	-	Plot data
Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	-	-	Plot data

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Proteaceae	*Grevillea mucronulata*	*Grevillea mucronulata*	-	-	Plot data
Proteaceae	*Grevillea robusta*	Grevillea robusta	-	-	Plot data
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	-	-	Plot data
Proteaceae	*Persoonia linearis*	Narrow-leaved Geebung	-	-	Incidental
Ranunculaceae	*Clematis aristata*	Old Man's Beard	-	-	Plot data
Ranunculaceae	*Clematis glycinoides*	Clematis glycinoides	-	-	Plot data
Ranunculaceae	*Clematis glycinoides* var. *glycinoides*	Clematis glycinoides var. glycinoides	-	-	Plot data
Rhamnaceae	*Cryptandra amara*	Bitter Cryptandra	-	-	Plot data
Rhamnaceae	*Cryptandra spinescens*	*Cryptandra spinescens*	-	-	Plot data
Rosaceae	*Rubus fruticosus* sp. agg.	Blackberry complex	-	-	Plot data
Rubiaceae	*Asperula conferta*	Common Woodruff	-	-	Plot data
Rubiaceae	*Galium aparine*	Galium aparine	-	-	Plot data
Rubiaceae	*Galium leptogonium*	*Galium leptogonium*	-	-	Plot data
Rubiaceae	*Opercularia diphylla*	Stinkweed	-	-	Plot data
Rubiaceae	*Pomax umbellata*	Pomax	-	-	Plot data
Rubiaceae	*Pomax umbellata*	Pomax	-	-	Incidental
Rubiaceae	*Richardia stellaris*	*Richardia stellaris*	-	-	Plot data
Rutaceae	*Boronia anethifolia*	*Boronia anethifolia*	-	-	Plot data
Rutaceae	*Boronia ledifolia*	Sydney Boronia	-	-	Plot data
Rutaceae	*Correa reflexa*	Native Fuschia	-	-	Plot data
Rutaceae	*Correa reflexa* var. *reflexa*	Native Fuschia	-	-	Plot data
Rutaceae	*Zieria cytisoides*	Downy Zieria	-	-	Plot data
Rutaceae	*Zieria smithii*	Sandfly Zieria	-	-	Plot data
Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart	-	-	Plot data
Santalaceae	*Exocarpos strictus*	Dwarf Cherry	-	-	Plot data
Sapindaceae	*Dodonaea triquetra*	Large-leaf Hop-bush	-	-	Plot data
Sapindaceae	*Dodonaea triquetra*	Large-leaf Hop-bush	-	-	Incidental

Family	Scientific name	Common name	Status		Incidental or Plot observation
			BC Act	EPBC Act	
Solanaceae	*Lycium ferocissimum*	African Boxthorn	-	-	Plot data
Solanaceae	*Solanum americanum*	Glossy Nightshade	-	-	Plot data
Solanaceae	*Solanum chenopodinum*	*Solanum chenopodinum*	-	-	Plot data
Solanaceae	*Solanum mauritianum*	Wild Tobacco Bush	-	-	Plot data
Solanaceae	*Solanum nigrum*	Black-berry Nightshade	-	-	Plot data
Solanaceae	*Solanum prinophyllum*	Forest Nightshade	-	-	Plot data
Solanaceae	*Solanum pseudocapsicum*	Madeira Winter Cherry	-	-	Plot data
Solanaceae	*Solanum seaforthianum*	Climbing Nightshade	-	-	Plot data
Solanaceae	*Solanum sisymbriifolium*	Solanum sisymbriifolium	-	-	Plot data
Stackhousiaceae	*Stackhousia viminea*	Slender Stackhousia	-	-	Plot data
Ulmaceae	*Trema tomentosa var. aspera*	Native Peach	-	-	Plot data
Ulmaceae	*Ulmus parvifolia*	Ulmus parvifolia	-	-	Plot data
Verbenaceae	*Verbena bonariensis*	Purpletop	-	-	Plot data
Verbenaceae	*Verbena bonariensis*	Purpletop	-	-	Incidental
Verbenaceae	*Verbena officinalis*	Common Verbena	-	-	Plot data
Verbenaceae	*Verbena rigida* var. *rigida*	Veined Verbena	-	-	Plot data

Recorded fauna

Class	Scientific name	Common name	Status	
			BC Act	EPBC Act
Aves	*Anas castanea*	Chestnut Teal	-	-
Aves	*Anas gracilis*	Grey Teal	-	-
Aves	*Anas superciliosa*	Pacific Black Duck	-	-
Aves	*Aythya australis*	Hardhead	-	-
Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	-	-
Aves	*Cacatua sanguinea*	Little Corella	-	-

Class	Scientific name	Common name	Status	
			BC Act	EPBC Act
Aves	*Caligavis chrysops*	Yellow-faced Honeyeater	-	-
Aves	*Calyptorhynchus lathami*	Glossy Black-Cockatoo (Probable)	VU	VU
Aves	*Chenonetta jubata*	Australian Wood Duck	-	-
Aves	*Cincloramphus cruralis*	Brown Songlark	-	-
Aves	*Colluricincla harmonica*	Grey Shrike-thrush	-	-
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	-	-
Aves	*Cormobates leucophaea*	White-throated Treecreeper	-	-
Aves	*Corvus coronoides*	Australian Raven	-	-
Aves	*Corvus mellori*	Little Raven	-	-
Aves	*Cracticus tibicen*	Australian Magpie	-	-
Aves	*Egretta novaehollandiae*	White-faced Heron	-	-
Aves	*Eolophus roseicapillus*	Galah	-	-
Aves	*Euploea core*	Common Crow	-	-
Aves	*Falco berigora*	Brown Falcon	-	-
Aves	*Fulica atra*	Eurasian Coot	-	-
Aves	*Gallinula tenebrosa*	Dusky Moorhen	-	-
Aves	*Glossopsitta concinna*	Musk Lorikeet	-	-
Aves	*Grallina cyanoleuca*	Magpie-lark	-	-
Aves	*Lichenostomus melanops*	Yellow-tufted Honeyeater	-	-
Aves	*Malurus cyaneus*	Superb Fairy-wren	-	-
Aves	*Manorina melanocephala*	Noisy Miner	-	-
Aves	*Microcarbo melanoleucos*	Little Pied Cormorant	-	-
Aves	*Origma solitaria*	Rockwarbler	-	-
Aves	*Pardalotus punctatus*	Spotted Pardalote	-	-
Aves	*Petrochelidon nigricans*	Tree Martin	-	-
Aves	*Phalacrocorax sulcirostris*	Little Black Cormorant	-	-
Aves	*Phaps chalcoptera*	Common Bronzewing	-	-

Class	Scientific name	Common name	Status	
			BC Act	EPBC Act
Aves	*Platycercus eximius*	Eastern Rosella	-	-
Aves	*Porphyrio porphyrio*	Purple Swamphen	-	-
Aves	*Rhipidura albiscapa*	Grey Fantail	-	-
Aves	*Sturnus vulgaris*	Common Starling	-	-
Aves	*Tachybaptus novaehollandiae*	Australasian Grebe	-	-
Aves	*Tyto novaehollandiae*	Masked Owl	VU	-
Aves	*Vanellus miles*	Masked Lapwing	-	-
Mammals	*Acrobates pygmaeus*	Feathertail Glider	-	-
Mammals	*Antechinus* sp.	Unidentified antechinus	-	-
Mammals	*Capra hircus*[1]	Goat	-	-
Mammals	*Cervus* sp.[1]	Unidentified Deer	-	-
Mammals	*Chalinolobus dwyeri*	Large-eared Pied Bat (probable)	VU	VU
Mammals	*Chalinolobus gouldii*	Gould's Wattled Bat (confirmed identification)	-	-
Mammals	*Chalinolobus morio*	Chocolate Wattled Bat (confirmed identification)	-	-
Mammals	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle (species group)	VU	-
Mammals	*Felis catus*[1]	Cat	-	-
Mammals	*Macropus giganteus*	Grey Kangaroo	-	-
Mammals	*Microchiroptera suborder*	Unidentified Microbat	-	-
Mammals	*Micronomus norfolkensis*	Eastern Coastal Free-tailed Bat (confirmed identification)	VU	-
Mammals	*Miniopterus orianae oceanensis*	Large Bent-winged Bat (species group)	VU	-
Mammals	*Myotis macropus*	Southern Myotis (species group)	VU	-
Mammals	*Nyctophilus geoffroyi*	Lesser Long-eared Bat (species group)	-	-
Mammals	*Nyctophilus gouldi*	Gould's Long-eared Bat (species group)	-	-
Mammals	*Oryctolagus cuniculus*[1]	Rabbit	-	-
Mammals	*Ozimops ridei*	Ride's Free-tailed Bat (confirmed identification)	-	-
Mammals	*Petaurus breviceps*	Sugar Glider	-	-
Mammals	*Phascolarctos cinereus*	Koala	EN	EN

Class	Scientific name	Common name	Status	
			BC Act	EPBC Act
Mammals	*Pteropus poliocephalus*	Grey-headed Flying-fox	VU	VU
Mammals	*Rattus fuscipes*	Bush Rat	-	-
Mammals	*Rattus rattus*[1]	Black Rat	-	-
Mammals	*Saccolaimus flaviventris*	Yellow-bellied Sheathtail-bat	VU	
Mammals	*Scoteanax rueppellii*	Greater Broad-nosed Bat (probable)	VU	-
Mammals	*Scotorepens orion*	South-eastern Broad-nosed Bat (probable)	-	-
Mammals	*Tachyglossus aculeatus*	Echidna	-	-
Mammals	*Trichosurus vulpecula*	Common Brushtail Possum	-	-
Mammals	*Vespadelus darlingtoni*	Large Forest Bat (probable)	-	-
Mammals	*Vespadelus regulus*	Southern Forest Bat (species group)	-	-
Mammals	*Vespadelus vulturnus*	Little Forest Bat (probable)	-	-
Mammals	*Vombatus ursinus*	Common Wombat	-	-
Mammals	*Vulpes vulpes*[1]	Fox	-	-
Mammals	*Wallabia bicolor*	Swamp Wallaby	-	-
Reptiles	*Chelodina longicollis*	Eastern Snake-necked Turtle	-	-
Reptiles	*Chelodina* sp.	Long-Necked Turtle Species Unknown	-	-
Reptiles	*Intellagama lesueurii*	Eastern Water Dragon	-	-
Amphibians	*Crinia signifera*	Common Eastern Froglet	-	-
Amphibians	*Limnodynastes peronii*	Brown-striped Frog	-	-
Amphibians	*Litoria dentata*	Bleating Tree Frog	-	-
Amphibians	*Litoria fallax*	Eastern Dwarf Tree Frog	-	-
Amphibians	*Litoria peronii*	Peron's Tree Frog	-	-
Amphibians	*Litoria verreauxii*	Verreaux's Frog	-	-
Amphibians	*Uperoleia laevigata*	Smooth Toadlet	-	-
Gastropods	*Austrorhytida capillacea*	Austrorhytida capillacea	-	-
Gastropods	*Meridolum sheai*[1]	Meridolum sheai	-	-

[1] Exotic species

Appendix B: Habitat suitability assessment

Use the below criteria to determine the likelihood that a threatened species could occur in the study area. The criteria are designed for use in a BAR only and is not applicable for use in a BDAR (i.e., where the BAM-C is being used). Only recorded sightings from BioNet are valid for these criteria.

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey or has been recorded within the past five years (known from a reputable source).
High	A species is considered highly likely to occur in the study area if: • *There are previous credible records on BioNet within the study area from the last 10 years and suitable habitat is present.* **OR** • *The species is highly mobile, is dependent on identified suitable habitat within the study area (i.e., for breeding or important life cycle periods such as winter flowering resources) and has been recorded recently (within five years) on BioNet in the locality. This also includes species known or likely to visit the study area during regular seasonal movements or migration.*
Moderate	A species is considered moderately likely to occur in the study area if: • *Any suitable habitat (e.g., foraging) is present in the study area, the species is highly mobile and has been recorded in the locality in the last 10 years on BioNet. The species may be unlikely to maintain sedentary populations, however, may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area.* **OR** • *The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has been recorded in the locality in the last 10 years on BioNet.* **OR** • *For flora species that are associated with PCTs in the study area (see TBDC) or have been recorded in the locality in the last 10 years on BioNet – the associated PCT/habitat present in the study area is not degraded and the species was not targeted by surveys in accordance with the BAM and relevant survey guidelines. In addition, for flora species known to occur in disturbed areas (e.g., orchids), records from any time within the locality may warrant inclusion in this category.*
Low	A species is considered to have a low likelihood of occurring in the study area if: • *For highly mobile species, the species may be an occasional visitor, but habitat similar to the study area is widely distributed in the locality, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowering resources) on habitats in the study area and the species has not been recorded in the locality in the last 10 years on BioNet.* **OR** • *The species is not highly mobile, is dependent on identified suitable habitat features (e.g., hollows, rocky outcrops) within the study area and has not been recorded in the locality in the last 10 years on BioNet.* **OR** • *For flora species that are associated with PCTs in the study area (see TBDC) and the species was not identified following targeted surveys in accordance with the BAM and relevant survey guidelines. Flora species that have been recorded in the locality on BioNet at any time, associated suitable habitat (see the TBDC) is not present in the study area, though similar habitats of the same vegetation formation is present in the study area.*

Unlikely	Suitable habitat for the species is absent from the study area.

Habitat suitability assessment table

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Plants							
Acacia baueri subsp. *aspera*	VU	-	Species	Grows in open, exposed conditions on infertile sandy loams.	Low, well branched shrub occurring on the Kings Tableland, the Woronora Plateau, Mt Kiera district and in Wedderburn. Grows in low heath, primarily on exposed sandstone ridges in Sydney Coastal Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths and Wallum Sand Heaths.	0	Unlikely – This species is not a BAM candidate species and no records occur within 10km of the study area. General populations for the species occur in the Blue Mountains/Royal National Parks.
Acacia bynoeana Bynoe's Wattle	E1	VU	Species	Prefers open, slightly disturbed sites on sandy soils.	Semi prostrate shrub growing in central eastern NSW spanning from the Hunter District, west to the Blue Mountains and south to the Southern Highlands. Grows in a variety of communities including; Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths.	50 - BioNet	Moderate – BAM candidate species. Numerous records occur within 10km of the study area. Targeted surveys within the study area were completed in areas with suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state Whilst the species has been known to show preference to disturbed areas, due to the fragmented nature of populations and their small size, the species is susceptible to heavy disturbance and vegetation is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Acacia flocktoniae	VU	VU	Species	Grows on sandstone.	Erect or pendulous shrub confined to Mount Victoria, Megalong Valley and	0	Unlikely – This species is not a BAM candidate species and no records occur within 10km of the

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Yerranderie in the Southern Blue Mountains. Grows in a variety of communities including Central Gorge Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Southern Tableland Grassy Woodlands and North Coast Wet Sclerophyll Forests.		study area. The Flockton Wattle is found only in the Southern Blue Mountains, which is outside the study area.
Acacia gordonii	E1	EN	Species	Rocky areas and sandstone outcrops or ridgetops. Grows on shallow soils.	Erect or spreading shrub confined to a disjunct distribution in the Lower Blue Mountains and the Maroota-Glenorie area. Grows on sandstone outcrops and platforms in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Heath Swamps, Sydney Coastal Heaths and Sydney Montane Heaths.	0	Unlikely – This species is not a BAM candidate species and no records occur within 10km of the study area. The general population of this species occurs further North
Acacia prominens	E2	-	Species	Hurstville and Kogarah local government areas	Erect or spreading tree growing in a few sites at Carss Park and along the railway line at Penshurst. Grows in a variety of communities including Cumberland Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests and Northern Hinterland Wet Sclerophyll Forests.	0	Unlikely – The distribution of the endangered population is outside of the Wollondilly local government area.
Acacia pubescens	VU	VU	Species	Grows on shale, sandstone, alluvium and gravely soils, often including ironstone.	A spreading shrub primarily confined to the Bankstown-Fairfield-Rookwood area and the Pitt Town area, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows in Cooks/River Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland, usually within roadside and bushland remnants.	0	Moderate – BAM candidate species. Suitable habitat present. No records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip and was inspected visually by suitably qualified ecologists. Given this species is easily identifiable, it is unlikely to remain undetected even with visual surveys. With this in

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
							consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Allocasuarina glareicola	E1	EN	Species	Grows in lateritic soil.	Small, depauperate shrub restricted to a few populations in the Richmond district with an outlier population at Voyager Point in Liverpool. Grows in Castlereagh Woodlands, Cumberland Dry Sclerophyll Forest, Sydney Hinterland Dry Sclerophyll Forest, Sydney Sand Flats Dry Sclerophyll Forests.	0	Unlikely – This species is not a BAM candidate species and no records of the species occur within 10km of the study area. Vegetation present is generally not associated with the species.
Arthropteris palisotii	E1	-	Species	Found growing on tree trunks in rainforest.	Epiphytic fern with a distribution spanning from the Illawarra Escarpment to North-eastern NSW as well as Queensland.	0	Unlikely – Not a BAM candidate species. No records occur within 10km and this species is generally found in Northern NSW/QLD with some records in the Illawarra Escarpment.
Astrotricha crassifolia	VU	VU	Species	Grows on sandstone substrates.	Root-suckering shrub growing near Patonga in Gosford, the Royal National Park, the Woronora Plateau and an outlier population at Glen Davis. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Western Slopes Grasslands and Sydney Coastal Heaths.	0	Unlikely – Not a BAM candidate species. No records occur within 10km and primary populations for this species occur further South in Patonga.
Caesia parviflora var. *minor*	E1	-	Species	Grows on sandstone substrate.	Small herb primarily occurs in Tasmania, southern Victoria and south-east South Australia. The NSW population is situated in Barcoongere State Forest between Grafton and Coffs Harbour. Grows in damp places in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Southern Escarpment Wet Sclerophyll Forests.	0	Unlikely – Not a BAM candidate species. No records occur within 10km and habitat suitable for the species is absent.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Caladenia tessellata Thick Lip Spider Orchid	E1	VU	Species	Grows on clay loam or sandy soils.	Small orchid recorded from the Wyong, Ulladulla and Braidwood regions with the Kiama and Queanbeyan populations believed to be extinct. Found in a wide variety of communities including Central Gorge Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Coastal Floodplain Woodlands and Subalpine Woodlands.	0	Moderate – BAM candidate species. Vegetation present within the study area is associated with the species. Targeted surveys were completed across the proposal site in October, with the exception of Lot 7 in DP 1280088 and Lots 16 and 18 in DP251051. Due to the cryptic nature of the species and suitable habitat being present in areas not subject to surveys, presence has been assumed.
Callistemon linearifolius	VU	-	Species		Shrub recorded from the Georges River to the Hawkesbury River, north of the Nelson Bay area and south at Coalcliff in the Illawarra region. Grows on the coast and adjacent ranges in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Sydney Coastal Heaths and North Coast Wet Sclerophyll Forests.	0	Moderate – BAM candidate species. Suitable habitat present. No records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Callitris endlicheri - endangered population	E2	-	-	Found on skeletal sandy loams.	Tree growing on the Woronora Plateau. Grows on stony hills or ridges from the coastal ranges to plains in Sydney Coastal Heaths.	0	Unlikely – Not a BAM candidate species. No records occur within 10km and habitat suitable for the species is absent.
Commersonia prostrata Dwarf Kerrawang	E1	EN	Species	Grows in sand or peat soils.	Ground hugging shrub with populations sparsely distributed in the Southern Highlands, Southern Tablelands and the North Coast. Grows in gullies, along drainage lines and in disturbed areas in a variety of communities including Coastal	6 - BioNet	Unlikely – Whilst a low abundance of records occur within 10km, populations of this species generally occur further south in the Southern Tablelands. Vegetation present within the study area is not considered to be associated with the species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Freshwater Wetlands of the Sydney Basin Bioregion, New England Dry Sclerophyll Forests, Temperate Montane Grasslands and Subalpine Grasslands.		
Cryptostylis hunteriana Leafless Tongue Orchid	VU	VU	Species	Grows in sandy soils.	Orchid with a distribution spanning from Gibraltar Range National Park southwards to the coastal area near Orbost in Victoria. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, New England Dry Sclerophyll Forests and Sydney Coastal Heaths.	0	Unlikely – Not a BAM candidate species. No records occur within 10km and habitat suitable for the species is absent.
Cynanchum elegans White-flowered Wax Plant	E1	EN	Species		Climbing vine restricted to eastern NSW from Brunswick Heads to Gerroa in the Illawarra region. Grows in rainforest gully scrub and scree slope on the edge of dry rainforests in a variety of communities including Coastal Floodplain Wetlands, Maritime Grasslands, Coastal Valley Grassy Woodlands and Northern Hinterland Wet Sclerophyll Forests.	11 - BioNet	Moderate – BAM candidate species. Suitable habitat present. No records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Daphnandra johnsonii	E1	EN	Species	Grows in loams and clay loams derived from volcanic and sedimentary substrates.	Rainforest Tree restricted to the Illawarra region including Shoalhaven, Kiama, Shellharbour and Wollongong. Found on rocky sites along gullies near creeks, in disturbed areas, and along the margins of Dry Rainforest,	0	Unlikely – Not a BAM candidate species. No records occur within 10km and habitat suitable for the species is absent. Species populations are restricted to the Illawarra region where it has been recorded from the local government areas of Shoalhaven, Kiama, Shellharbour and Wollongong

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Subtropical Rainforest and North Coast Wet Sclerophyll Forests.		
Darwinia biflora	VU	VU	Species	Grows in shale-sandstone transitional soils.	Erect shrub distributed in the Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas. Grows on edges of weathered shale capped ridges in the vicinity of an intergrade with Hawkesbury sandstone in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Sydney Coastal Heaths.	1 - BioNet	Unlikely – Not a BAM candidate species. Only one record occurs within 10km and habitat suitable for the species is absent. Populations of the species are generally found further North.
Darwinia peduncularis	VU	-	Species	Occurs in close proximity to rocky areas.	Spreading shrub growing in disjunct populations ranging from the Blue Mountains, Berowra, Hornsby and Glen Davis areas. Grows on or near rocky outcrops in a variety of communities including Central Gorge Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, and Sydney Coastal Heaths. Grows in well drained, low nutrient sand soils on sandstone substrates.	2 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Deyeuxia appressa	E1	EN	Species		Erect, perennial grass, endemic to NSW. Restricted to two records, one in 1930 at Herne Bay south of Bankstown and the other in 1941 from Killara near Hornsby. Grows on wet ground in Sydney Coastal Dry Sclerophyll Forests and Eastern Riverine Forests.	0	Low – Targeted surveys were completed in suitable habitat. No individuals were recorded.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Dillwynia tenuifolia	VU, E2	-	Species	Grows on tertiary alluvium, laterised clays and in shale-sandstone transitions.	Low, spreading shrub restricted to the Cumberland Plain in Western Sydney. Grows in scrubby or heathy areas within a variety of communities including Castlereagh Ironbark Forest, Shale Gravel Transition Forest, Castlereagh Scribbly Gum Woodland and Sydney Hinterland Dry Sclerophyll Forests.	2 - BioNet	Low – BAM candidate species. Suitable habitat present. Low abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September. However, vegetation within Lot 7 in DP1280088 and Lot 18 in DP251051 was not surveyed due to access constraints. Vegetation within Lot 7 was surveyed outside of the optimal survey period by a suitably qualified senior botanist and no unidentified *Dillwynia* spp. were recorded. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Epacris purpurascens var. *purpurascens*	VU	-	Species	Grows in soils with a strong shale influence on sandstone substrates.	Erect shrub distributed from Gosford in the north, Silverdale to the west, Narrabeen in the east and Avon Dam in the south. Grows in scrubs and swamps in a variety of communities including Cumberland Dry, Sydney Hinterland Dry, Northern Hinterland Wet, and Southern Tableland Wet Sclerophyll Forests, Eastern Riverine Forests, and Coastal Valley Grassy Woodlands.	287 - BioNet	Low – BAM candidate species. Numerous records within 10km and suitable habitat present. Targeted surveys were completed across areas of suitable habitat in September, except within Lots 16 and 18 in DP251051. These lots are primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to each lot. Whilst surveys were not completed in these lots, over 20ha was surveyed, and no individuals of the species were identified. Further to this, surveys did not detect any *Epacris spp*. (even those not threatened). This species therefore has a low likelihood of occurrence in areas to be impacted.
Eucalyptus benthami	VU	VU	Species	Grows in sandy, alluvial soils.	Tall tree confined to the lower Nepean area with two major	0	Unlikely – Not a BAM candidate species. No records occur within 10km. This species is also

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					subpopulations located at Kedumba Valley in Blue Mountains National Park and at Bents Basin State Recreation Park. Grows along valley floors within riparian flood zones at elevations between 30 - 300m in Central Gorge Dry Sclerophyll Forests, Sydney Sand Flats Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Eastern Riverine Forests and Coastal Valley Grassy Woodland.		inconspicuous in nature and is unlikely to remain undetected if present. Vegetation within the study area is not associated with the species.
Eucalyptus camfieldii	VU	VU	Species	Grows in sandy soils on Hawkesbury sandstone.	Mallee tree restricted to a narrow band stretching from Raymond Terrace to the north and Waterfall in the south. Grows in scattered, localised distributions including sites at Norah Head, Terrey Hills, North Head, Menai, Mt Colah, Peats Ridge and Elvina Bay Trail. Grows in scattered stands near the boundaries of tall coastal heath and low open woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Sydney Coastal Heaths and Wallum Sand Heaths.	0	Low – Not a BAM candidtate species. Targeted surveys were completed in suitable habitat. No individuals were recorded.
Eucalyptus macarthurii	E1	EN	Species	Grows on fertile soils.	Tall tree, distributed from the Moss Vale District to Kanangra Boyd National Park. Grows on broad, cold flats in a variety of communities including Sydney Montane Dry Sclerophyll Forests, Temperate Montane Grasslands, Subalpine Woodlands, Montane Bogs and Fens and Tableland Clay Grassy Woodlands.	0	Unlikely – Not a BAM candidate species. No records occur within 10km. This species is also inconspicuous in nature and is unlikely to remain undetected if present. Vegetation within the study area is not associated with the species.
Galium australe Tangled Bedstraw	E1	-	Species		Straggling, twining herb with an extant population in Nadgee Nature	1 - BioNet	Low – Not a BAM candidate species. Whilst one record occurs within 10km, vegetation present

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Reserve and historically recorded at Nowra and Narooma. Grows in a variety of communities including North Coast Wet Sclerophyll Forests, South Coast Sands Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands and Coastal Headland Heaths.		within the study area is not considered to be associated with the species.
Genoplesium baueri Bauer's Midge Orchid	E1	EN	Species	Grows on sandstone substrates	Terrestrial orchid with 13 populations totalling 200 plants distributed between Ulladulla and Port Stephens. Grows on moss gardens in a variety of communities including Sydney Coastal Dry sclerophyll Forests, Sydney Coastal Heaths, Sydney Montane Heaths, Southern Lowland Wet Sclerophyll Forests and Sydney Hinterland Dry Sclerophyll Forests.	0	Low – Not a BAM candidate species. No records occur within 10km. Vegetation present within the study area is not considered to be associated with the species.
Gossia acmenoides -	E1	-	-		Found in subtropical and dry rainforest on the ranges and coastal plain of eastern Australia. Known from Shellharbour, Wollongong and Kiama LGAs and encompasses all occurrences south of the Georges River. The population in the Sydney Basin Bioregion south of the Georges River is the southernmost occurrence of the species and is approximately 175 km from the nearest population to the north in the Hunter region of NSW. Estimated less than 100 mature plants, through approximately 30 sites. Occurring often as a single individual or small group.	0	Low – Not a BAM candidate species. No records occur within 10km. Populations are generally found further south in the LGAs of Wollongong, Kiama and Shellharbour. This species also prefers a rainforest environment, which is not present within the study area.
Grammitis stenophylla	E1	-	Species	Grows near streams in moist places on rocks or in trees.	Small fern growing on the south, central and north coasts of NSW with records from Mount Kaputar National Park at Narrabri forming its	0	Low - No records occur within 10km. Vegetation present within the study area is not considered to be associated with the species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
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					western limit. Associated with a variety of communities including Sydney Montane Dry Sclerophyll Forest, Dry Rainforest, Littoral Rainforest, Northern Warm Temperate Forests and North Coast Wet Sclerophyll Forests.		
Grevillea juniperina subsp. *juniperina*	V	-	Species	Grows in sandy to clay loam soils and red pseudolateritic gravels derived from Wianamatta Shale and Tertiary Alluvium.	Spreading to erect medium sized shrub endemic to Western Sydney with a distribution spanning from Blacktown, Erskine Park, Londonderry and Windsor and outlying populations at Kemps Creek and Pitt Town. Grows at elevations <50 m in Cumberland Plain Woodland, Castlereagh Ironbark Forest, Castlereagh Scribbly Gum Woodland, Shale/Gravel Transition Forest, Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands.	0	Moderate – BAM candidate species. Suitable habitat present. No records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. Areas inspected visually occur as thin linear strips and this species is easily identified, even from a distance. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely
Grevillea parviflora subsp. *parviflora* Small-flower Grevillea	V	VU	Species	Grows in sandy or light clay soils including tertiary alluviums over thin shales and lateritic ironstone gravels.	Low spreading to erect shrub sporadically distributed throughout the Sydney Basin, most notably in the Picton, Appin and Bargo regions, in the Cessnock - Kurri Kurri area and isolated populations from Putty to Wyong and Lake Macquarie. Grows in Shale Sandstone Transition Forest, Kurri Sand Swamp Woodland, Coymbia maculata - Angophora costata Open Forest in the Dooralong Area, Sydney Sandstone Ridgetop Woodland at Wedderburn	550 - BioNet	Moderate – BAM candidate species. Numerous records within 10km. Targeted surveys within the proposal site were completed in areas suitable habitat in September and November. However, vegetation within Lots 18 and 16 in DP251051 was not surveyed due to access constraints. Vegetation within both Lot 16 and 18 exists as a thin linear strips, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to each lot, with visual surveys being completed where

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
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					and Cooks River/Castlereagh Ironbark Forest at Kemps Creek.		appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely
Grevillea parviflora subsp. *supplicans*	E1	-	Species	Grows on sandstone substrates in skeletal sandy soils, also shows a preference for yellow clays with impeded drainage.	Low shrub restricted to a few locations in the Arcadia and Maroota-Marramarra Creek area including Marramarra National Park in Hornsby and Baulkham Hills Local Government Area. Grows in periodically disturbed areas in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests.	0	Low – Not a BAM candidtate species. Study area is outside the distribution for the species. Distribution of this sub species is limited to the north-west of Sydney near Arcadia and the Maroota–Marramarra Creek area, in Hornsby and Baulkham Hills local government areas.
Grevillea raybrownii	-	-	Species	Occurs on leached sandy, gravelly loam soils derived from sandstone.	All natural remnant sites occur within a habitat that is both characteristic and consistent between sites. Generally occurs on ridgetops and, less often, slopes and benches of Hawkesbury Sandstone and Mittagong Formation. It occurs in Eucalyptus open forest and woodland with a shrubby understorey. Killed by fire and relies entirely on seed that is stored in the soil for regeneration.	0	Low – Not a BAM candidate species. No records occur within 10km. Vegetation present within the study area is not considered to be associated with the species.
Gyrostemon thesioides	E1	-	Species	Occurs on sandy, alluvial or colluvial soil within 180 m of a water course.	Multi-stemmed shrub only recorded from three sites to the west of Sydney, near the Colo, Georges and Nepean Rivers. Grows on hillsides and riverbanks in a variety of communities including Central Gorge Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Western Slopes Grassy Woodlands and North Coast Wet Sclerophyll Forests. Grows on fine sandy soils	1 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
							completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Haloragis exalata subsp. *exalata* Square Raspwort	V	VU	Species	Occurs along the edges of coastal lakes after flooding has removed other vegetation, as well as within the flood zone on creek banks, and in areas close to these features subject to human disturbance including road verges and powerline easements or within 100m.	Small to medium sized shrub found growing in four widely scattered locations in eastern NSW including the central coast, south coast and north western slopes. Grows in damp, protected and shaded areas in riparian zones in a variety of communities including South East Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Montane Bogs and Fens and Northern Warm Temperate Rainforests.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Haloragodendron lucasii	E1	EN	Species	Occurs within 100m of seepage zones.	Erect shrub restricted to a very narrow distribution on the north shore of Sydney. Grows on sheltered aspects and gentle slopes below cliff lines adjacent to creeks in Sydney Coastal Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests, Eastern Riverine Forests, Sydney Coastal Heaths and Sydney Montane Heaths. Grows on sandstone substrates in moist, loamy soil containing high levels of phosphorous.	0	Low – Not a BAM candidate species. Targeted surveys were completed in suitable habitat. No individuals were recorded.
Helichrysum calvertianum	-	-	Species	Occurs in close proximity to rocky areas.	This plant occurs in dry sclerophyll forest and heathland with rock outcrops, predominantly on Hawkesbury sandstone soils, at altitudes between approximately 650 and 855 m. Rainfall ranges from 850 mm per annum at the western-	0	Low – Not a BAM candidate species. No records occur within 10km. Vegetation present within the study area is not considered to be associated with the species.

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					most sites, to over 1500 mm at the eastern-most site. It is likely the seeds are dispersed by winds.		
Hibbertia puberula	E1	-	Species		Shrublet with a distribution extending from Wollemi National Park south to Morton National Park and the south coast near Nowra. Grows in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Heath Swamps, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on sandy soils, occasionally on clay soils.	0	Moderate – BAM candidate species. No records within 10km. Suitable habitat present. Targeted survey were completed across areas of suitable habitat in October, except within Lots 16 and 18 in DP251051.Due to suitable habitat being present in areas not subject to surveys, presence has been assumed.
Hibbertia spanantha	E4A	CE	Species		Grows in forest with canopy species including *Eucalyptus pilularis*, *E. resinifera*, *Corymbia gummifera* and *Angophora costata*. The understorey is open with species of Poaceae, Orchidaceae, Fabaceae and Liliaceae. The soil is identified as a light clay occurring on a shale sandstone soil transition.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Hibbertia stricta subsp. *furcatula*	E1	-	Species		Small, upright shrub restricted to two populations, one in the southern outskirts of Sydney and the other near Nowra on the mid-South Coast of NSW. Grows on upper slopes and above the Woronora River Gorge escarpment in a variety of communities including South East Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, and Southern Lowland Wet Sclerophyll Forests. Sydney population grows at or near the interface between the Hawkesbury	0	Unlikely – Not a BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.

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					Sandstone and Lucas Heights soil landscapes, in gravelly loam or clay soils. Nowra population grows on sandstone substrates in sandy soils.		
Hibbertia superans	E1	-	Species		Low spreading shrub recorded from 16 sites with a distribution spanning from Baulkham Hills to South Maroota. Grows on sandstone ridgetops near shale/sandstone transitions in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Northern Hinterlands Wet Sclerophyll Forests, Coastal Valley Grassy Woodlands, and Sydney Coastal Heaths. Grows on sandstone substrates.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Hygrocybe anomala var. *ianthinomarginata*	V	-	Species	Typically occurs in very wet areas, including drainage areas and swamps.	Small, orange-brown coloured gilled fungus found in Lane Cove National Park in the Lane Cove Local Government Area. Also found in the Royal and Blue Mountains National Parks. Grows as individuals or in groups on terrestrial substrates including soil, hummus and moss, rarely on rotten wood in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Coastal Swamp Forests, Littoral Rainforests and North Coast Wet Sclerophyll Forests. Associated with alluvial sandy soils of the Hawkesbury Soil Landscape.	0	Unlikely – Not a BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Lasiopetalum joyceae	V	VU	Species		Erect, medium sized shrub restricted to 34 sites within the Hornsby Plateau from Berrilee to Duffys Forest. Grows on lateritic or shale influenced ridgetops in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll	0	Unlikely – Not a BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.

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					Forests and Sydney Coastal Heaths. Grows on sandstone substrates.		
Leucopogon exolasius Woronora Beard-heath	V	VU	Species		Erect shrub confined to the upper Georges River area and Heathcote National Park. Grows in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests, Eastern Riverine Forests, and Sydney Coastal Heaths. Grows on sandstone substrates.	13 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat in September. However, vegetation within Lot 7 in DP1280088 and Lots 16 and 18 in DP251051 was not surveyed due to access constraints. Vegetation within Lot 7 was surveyed outside of the optimal survey period by a suitably qualified senior botanist and no unidentified *Leucopogon* spp. were recorded. Lots and 16 and 18 exists as thin linear strips, which are primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lots 16 and 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Leucopogon fletcheri subsp. *fletcheri*	E1	-	Species	Occurs on slopes nearby rocky areas in close associated with sandstone-derived soils.	Erect, densely branched shrub restricted to north-west Sydney between St Albans in the north to Annangrove in the south. Grows along ridges and spurs on flat to gently sloping terrain in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands and Sydney Coastal Heaths. Grows on lateritic soils.	0	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat in September. However, vegetation within Lot 7 in DP1280088 and Lots 16 and 18 in DP251051 was not surveyed due to access constraints. Vegetation within Lot 7 was surveyed outside of the optimal survey period by a suitably qualified senior botanist and no unidentified *Leucopogon* spp. were recorded. Lots and 16 and 18 exists as thin linear strips, which are primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
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							completed within the road reserve adjacent to Lots 16 and 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Macadamia integrifolia Macadamia Nut	-	VU	Species		Medium sized tree found growing from Mount Bauple, near Gympie to Currumbin Valley in the Gold Coast hinterland in south-east Queensland. Occurs in the Northern Rivers region of NSW in remnant rainforest, mixed sclerophyll forest and rainforest margins.	1 - BioNet	Low – Not a BAM Candidate species. Natural distribution of the species occurs in northern NSW and south-east Queensland.
Marsdenia viridiflora subsp. *viridiflora*	EN	-	-		Slender climber with twining stems with a scattered distribution within the Prospect, Bankstown, Smithfield, Cabramatta Creek, St Mary's and north from Razorback Range. Grows in vine thickets and open shale woodland in a variety of communities including Cumberland Dry Sclerophyll Forests, Coastal Floodplains Wetlands, Coastal Valley Grassy Woodlands and Dry Rainforests.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Maundia triglochinoides	V	-	Species	Occurs in and adjacent to shallow bodies of water where depth does not exceed 1 m.	Perennial sedge restricted to coastal NSW from Wyong extending northwards to southern Queensland. Grows in shallow freshwater channels, lagoons, creeks, dams or swamps in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons, Coastal Heath Swamps and Coastal Valley Grassy Woodlands. Grows in heavy clay, low nutrient soils.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Melaleuca biconvexa	V	VU	Species		Large shrub or small tree confined to NSW with scattered, widely	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the

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					dispersed populations around the Jervis Bay area in the south and the Gosford-Wyong area to the north. Grows in damp places, often near streams or low-lying areas on low slopes or sheltered aspects in a variety of communities including Hunter-Macleay Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Floodplain Wetlands, Coastal Freshwater Lagoon and North Coast Wet Sclerophyll Forests. Grows in alluvial soils.		study area is unlikely to provide suitable habitat within the study area.
Melaleuca deanei Deane's Paperbark	V	VU	Species	Grows on sandstone substrates in alluvial soils.	Medium sized shrub found growing in two distinct populations in the Ku-ring-gai/Berowra and Holsworthy/Wedderburn areas along with a few outliers at Springwood and in the Wollemi National Park, Yalwal and the Central Coast regions. Grows in ridgetop woodland in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, South East Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths.	44 - BioNet	Moderate – BAM candidate species. Suitable habitat present. moderate abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Persicaria elatior Tall Knotweed	V	VU	Species	Occurs close to semi-permanent or ephemeral bodies of water.	Erect herb found growing in south-eastern NSW at Mount Dromedary, Moruya State Forest near Turlinjah, Upper Avon River catchment north of Robertson, Bermagui and Picton Lakes. Also grows in northern NSW around Raymond Terrace near Newcastle and Cherry Tree and Gibberagee State Forests in the	1 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat in December. However, vegetation within Lots 16 and 18 in DP251051 was not surveyed due to access constraints.

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					Grafton area. Grows in damp places usually on the margins of waterbodies and in swamp forests in a variety of communities including Coastal Floodplain Wetlands, Coastal Swamp Forests, Eastern Riverine Forests, Coastal Freshwater Lagoons and Coastal Heath Swamps.		This species generally occurs close to semi-permanent or ephemeral bodies of water, of which are not present within the unsurveyed lots. Lots and 16 and 18 also exist as thin linear strips, which are primarily present in a degraded state and is therefore not considered to provide suitable habitat. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Persoonia acerosa	VU	VU	Species	Grows on sandstone substrates in low fertility soils.	Small, erect shrub found growing around the central coast and in the Blue Mountains from Mount Tomah to Hill Top. Grows in heathy or scrubby woodland including disturbed areas in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Sydney Montane Dry Sclerophyll Forests and Sydney Montane Heaths.	0	Low – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area. Southern populations of this species are now thought to be extinct with the primary population occurring in the Blue Mountains.
Persoonia bargoensis Bargo Geebung	E1	VU	Species	Grows in heavy well drained, loamy or gravelly soils derived from Wianamatta Shales and Hawkesbury Sandstone.	Erect, bushy shrub restricted to a small area on the western edge of the Woronora Plateau and the northern edge of the Southern Highlands south-west of Sydney. Grows in woodland, forest and disturbed areas in transitional soils in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands and North Coast Wet Sclerophyll Forests.	617 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Moderate abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Persoonia glaucescens Mittagong Geebung	E1	VU	Species	Grows on sandstone substrates in clay or gravel laterites.	Erect shrub with a historical distribution which extends from Couridjah (Thirlmere Lakes) to the	38 - BioNet	Low – BAM candidate species. Despite records within 10km, vegetation within the study area is

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					north and east, Fitzroy Falls to the south and High Range to the west. Current distribution is reduced to Berrima to the south and Buxton to the north. Grows on ridge tops, plateaux, upper slopes and disturbed areas in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests and Southern Tableland Grassy Woodlands.		unlikely to provide suitable habitat within the study area.
Persoonia hirsuta Hairy Geebung	E1	EN	Species	Grows in sandy soils on sandstone substrates	Spreading, hairy shrub with a scattered distribution throughout Sydney from Singleton to the north, the east coast of Bargo to the south and the Blue Mountains to the west. Grows at elevations between 350 - 600 metres in a variety of communities including Southern Tableland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Western Slopes Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Southern Escarpment Wet Sclerophyll Forests..	20 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Moderate abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Persoonia mollis subsp. *maxima*	E1	EN	Species	Grows on Hawkesbury sandstone substrates.	Tall, spreading shrub restricted to three populations in the Hornsby Heights - Mount Colah area. Grows in sheltered aspects of deep gullies or on the steep upper hillsides of narrow gullies in Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests and North Coast Wet Sclerophyll Forests.	0	Low – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area.

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Persoonia mollis subsp. *revoluta*	-	-	Species	Most of the populations occur between altitudes of 600 to 800 m, and with an average annual rainfall across the range of between 700 and 900 mm.	This species is found on relatively deep sandy soils on broad ridgetops and upper slopes. It is frequently found on Hawkesbury Sandstone on Soapy Flat or Sandy Flat soil landscapes. The species is endemic to New South Wales where it is currently known to occur in seven populations, primarily in the area between Mittagong, Paddys River and High Range in the Southern Highlands with an outlying population in the Bindook Highlands.	1 - BioNet	Low – BAM candidate species. Only one record within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Persoonia nutans Nodding Geebung	E1	EN	Species	Grows in sandy soils derived from aeolian or alluvial sediments as well as in tertiary alluviums to the south of its range.	Erect or spreading shrub with a disjunct distribution restricted to the Cumberland Plain between Richmond in the north and Macquarie Fields in the south with core distribution occurring in the Penrith and to a lesser extent, Hawkesbury regions. Grows in Cumberland Dry Sclerophyll Forests including Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland, Cooks River/Castlereagh Ironbark Forest and Shale-Sandstone Transition Forest as well as Sydney Sand Flats Dry Sclerophyll Forests and Coastal Valley Grassy Woodlands.	1 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Moderate abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Pilularia novae-hollandiae Austral Pilwort	E1	-	Species	Grows in mud amongst grasses and sedges.	Semi-aquatic fern with the only extant populations located at Lake Cowal and Oolambeyan National Park. Historical distribution ranged from Sydney, Khancoban, The Riverina near Albury and Urana. Grows in seasonally dry depressions, drainage lines, margins of marshes, shallow swamps and waterways in a	0	Moderate – BAM candidate species. No records within 10km. Suitable habitat present. Targeted survey were completed across areas of suitable habitat in November, except within Lots 16 and 18 in DP251051.Due to suitable habitat being present in areas not subject to surveys, presence has been assumed.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					variety of communities including Inland Riverine Forests, Inland Floodplain Swamps, Southern Tableland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons.		
Pimelea curviflora var. *curviflora*	VU	VU	Species	Grows on sandstone substrates in shale/lateritic soils and shale/sandstone transition soils.	Small to medium sized shrub restricted to the coastal areas of Sydney between northern Sydney and Maroota with an outlying population at Croom Reserve near Albion Park in the Illawarra region. Grows on ridgetops and upper slopes amongst grasses and sedges in a variety of communities including Cumberland Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Sydney Coastal Heaths and Northern Hinterland Wet Sclerophyll Forests. Can be inconspicuous amongst grasses and sedges although easier to find in October to May when flowering.	3 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat in December. However, vegetation within Lots 16 and 18 in DP251051 was not surveyed due to access constraints. Lots and 16 and 18 also exist as thin linear strips, which are primarily present in a degraded state and is therefore not considered to provide suitable habitat. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Pimelea spicata Spiked Rice-flower	E1	EN	Species	Grows on well-structured clay soils.	Small erect or spreading shrub with populations occurring in two disjunct areas, one occurring on the Cumberland Plain from Marayong and Prospect Reservoir south to Narellan and Douglas Park, and the other occurring in the Illawarra from Landsdowne to Shellharbour and north Kiama. Grows in Maritime Grasslands and Coastal Valley Grassy Woodlands including Cumberland Plain Woodlands and Moist Shale Woodlands within the Cumberland Basin and in Coast Banksia Open	16 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Moderate abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat from September-February. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration,

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Woodland Coastal Grasslands in the Illawarra region.		the presence of the species within these unsurveyed areas specifically is considered unlikely.
Pomaderris adnata	E1	-	Species	Grows on sandstone substrates in sandy loam soils.	Medium sized spreading shrub restricted to one site at Sublime Point, north of Wollongong. Grows on the edge of the plateau behind the Illawarra escarpment in association with Silver-top Ash *Eucalyptus sieberi* Red Bloodwood *Corymbia gummifera* Forest, Sydney Coastal Dry Sclerophyll Forests, Southern Lowland Wet Sclerophyll Forests.	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area. This species is also only known from one population at Sublime Point, north of Wollongong.
Pomaderris brunnea Brown Pomaderris	E1	V	Species	Grows in clay and alluvial soils.	Medium sized shrub with a distribution limited to the area around the Colo, Nepean and Hawkesbury Rivers including the Bargo area and near Camden. Grows on floodplains and creek lines in a variety of communities including Sydney Hinterland Dry Sclerophyll Forests, Central Gorge Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Valley Grasslands and North Coast Wet Sclerophyll Forests.	15 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat in October. However, vegetation within Lot 7 in DP1280088 was not surveyed due to access constraints. Vegetation within Lot 7 was surveyed outside of the optimal survey period by a suitably qualified senior botanist and no unidentified *Pomaderris* spp. were recorded. Surveys were also completed within the road reserve adjacent to Lot 7, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Pomaderris cotoneaster Cotoneaster Pomaderris	E1	EN	Species	Grows in skeletal soils or deep friable soils.	Medium sized shrub with a disjunct distribution with records from the Nungatta areas, northern Kosciuszko National Park, Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, Yerranderie	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					area, Kanangra-Boyd National Park, Canyonleigh area and Ettrema Gorge in Morton National Park. Grows amongst rocks adjacent to creeks, rocky forested slopes and in steep gullies between sandstone cliffs in a variety of communities including Central Gorge Dry Sclerophyll Forests, South East Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Subalpine Woodlands, Southern Tableland Wet Sclerophyll Forests.		
Pomaderris prunifolia	E2	-	-	Grows in shale soils on sandstone substrates.	Small shrub restricted to the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas including Rydalmere, Rookwood Cemetery and The Crest at Bankstown. Found growing on rocky slopes adjacent to creek lines, road reserves and small gullies in Cumberland Dry Sclerophyll Forests including Cooks River/Castlereagh Ironbark Forest and Northern Hinterland Dry Sclerophyll Forests.	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area. Endangered population occurs only in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas
Prasophyllum affine	E1	EN	Species	Grows on poorly drained clay soils.	Terrestrial orchid restricted to three areas south-east of Nowra, at Kinghorne Point, Wowly Gully near Callala Bay and near the town of Vincentia. Found growing in heathland and sedgeland in Sydney Coastal Heaths. This species is cryptic and most visible when flowering between November and December.	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area.
Prasophyllum fuscum	E4A	VU	Species	Grows in moist sandy soils over sandstone substrates.	Terrestrial orchid restricted to the George's River area in Sydney although Harden (2003) states that it also occurs in the Blue Mountains area and some authorities believe it is identical to P. uroglossum from the	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area. Species if confined to the Blue Mountains area

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Wingecarribee Area. Found growing in boggy soils, in running water, in drainage lines or moist, open heath amongst sedges and grasses in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Coastal Valley Grassy Woodlands, Wallum Sand Heaths, Sydney Coastal Heaths and Sydney Montane Heaths. A cryptic species which is visible as a leaf from April to December, and by flower from September to December.		
Prostanthera densa	VU	VU	Species	Grows on Sandstone substrates.	Medium sized erect shrub recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens. Found growing in sclerophyll forest and shrubland on rocky slopes near coastal headlands and near-coastal ranges in South Coast Sands Dry Sclerophyll Forests, Sydney Coastal Dry Sclerophyll Forests, Maritime Grasslands, Sydney Coastal Heaths, Wallum Sand Heaths and Southern Lowland Wet Sclerophyll Forests.	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area. Known to occur primarily at Bass and Flinders Point in Cronulla.
Pterostylis gibbosa	E1	EN	Species	Grows in red brown loam soils.	Deciduous terrestrial orchid with a disjunct distribution from the Milbrodale in the Hunter Region, Albion Park and Yallah in the Illawarra Region and Nowra in the Shoalhaven Region. Found growing amongst grasses on flat or gently sloping land with poor drainage in woodland dominated by Forest Red Gum *Eucalyptus tereticornis*, Woolybutt *E. longifolia*, and White Feather Honey-*myrtle Melaleuca decora*. In Nowra, the orchid can be found growing in association with	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area. Generally thought to be extinct from the Sydney Basin with primary populations existing in the Illawarra and Shoalhaven regions

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Spotted Gum *Corymbia maculata*, Forest Red Gum and Grey Ironbark *E. paniculata.* In the Hunter Region, the orchid is associated with Narrow-leaved Ironbark E. *crebra*, Forest Red Gum and Black Cypress Pine *Callitris endlicheri.*		
Pterostylis saxicola Sydney Plains Greenhood	E1	EN	Species	Grows in small pockets of shallow shale or shale/sandstone transition soils over sandstone substrates.	Deciduous terrestrial orchid restricted to a few small populations located in Western Sydney between Freemans Reach in the north and Picton in the south including Georges River National Park. Found growing near streams in depression on sandstone rock shelves above cliff lines faces, moist, sheltered ridges and creek banks on mossy rocks in Temperate Montane Grasslands, Northern Warm Temperate Rainforests, Southern Warm Temperate Rainforests and Southern Tableland Wet Sclerophyll Forests.	1 - BioNet	Moderate – BAM candidate species. Vegetation present within the study area is associated with the species. Targeted surveys were completed across the proposal site in October, with the exception of Lot 7 in DP 1280088 and Lots 16 and 18 in DP251051. Due to the cryptic nature of the species and suitable habitat being present in areas not subject to surveys, presence has been assumed.
Pterostylis sp. *Botany Bay*	E1	EN	Species	Grows in skeletal sandy soils derived from sandstone.	Deciduous terrestrial orchid restricted to a few small populations located in Botany Bay National Park on the Kurnell Peninsula. Found growing on moist level sites amongst heathland in association with melaleuca nodosa and Baeckea imbricata.	0	Unlikely – Not a BAM candidate species. No records of the species occur within 10km of suitable habitat is absent from the study area. Populations are restricted to the botany Bay/Kurnell region.
Pultenaea aristata Prickly Bush-pea	VU	VU	Species	Grows on sandstone substrates.	Small shrub restricted to the Woronora Plateau between Helensburgh and Mount Kiera. Found growing in Sydney Coastal Dry Sclerophyll Forests, Coastal Heath Swamps, Southern Lowland Wet Sclerophyll Forests and Coastal Swamp Forests.	2 - BioNet	Unlikely – Not a BAM candidate species. Low abundance of records of the species occurs within 10km. Suitable habitat is absent from the study area
Pultenaea pedunculata	E1	-	Species	Grows in a variety of soils including sandy	Small prostrate, mat forming shrub restricted to three disjunct	0	Moderate – BAM candidate species. No records within 10km. Suitable habitat present.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
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				clay soils, loam soils, transitional soils with ironstone nodule inclusions and soils derived from Wianamatta shale, laterite or alluvium.	populations, in Villawood, Prestons and north-west of Appin in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn. Found growing in a variety of habitats including intact woodland, creek lines, broad valleys, headlands, rock crevices, disturbed sites such as road batters and coastal cliffs in a variety of communities including Central Gorge Dry Sclerophyll Forests, South Coast Sands Dry Sclerophyll Forests, Cumberland Dry Sclerophyll Forests, Temperate Montane Grasslands, Coastal Valley Grassy Woodlands and Southern Tableland Wet Sclerophyll Forests.		Targeted survey were completed across areas of suitable habitat in October, except within Lots 16 and 18 in DP251051.Due to suitable habitat being present in areas not subject to surveys, presence has been assumed.
Rhizanthella slateri Eastern Australian Underground Orchid	VU, E2	EN	Species	Grows in deep loam soils.	Terrestrial orchid with a distribution spanning from south-east NSW to south-east Queensland. Recorded in ten populations in NSW including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wisemans Ferry Area, Agnes Banks and near Nowra. A cryptic species which grows beneath the soil surface with flowers being the only part of the plant to occur aboveground in Sydney Sand Flats Dry Sclerophyll Forests, Eastern Riverine Forests, Northern Warm Temperate Rainforests, North Coast Wet Sclerophyll Forests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests.	0	Low – BAM Candidate species. No records within 10km of the study area. Suitable habitat present. Targeted surveys within the proposal site were completed in areas suitable habitat in November. However, vegetation within Lot 7 in DP1280088 and Lots 16 and 18 in DP251051 was not surveyed due to access constraints. Vegetation within Lot 7 was surveyed outside of the optimal survey period by a suitably qualified senior botanist and no individuals were recorded. Lots and 16 and 18 exists as thin linear strips, which are primarily present in a degraded state and is therefore not considered to provide suitable habitat.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Rhodamnia rubescens Scrub Turpentine	CE	CE	Species	Usually grows on volcanic and sedimentary soils.	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Senna acclinis	E1	-	Species		Tall shrub with populations occurring in the coastal districts and adjacent tablelands from the Illawarra to Queensland. Found growing on rainforest margins, often fulfilling the role of a gap phase shrub in a variety of communities including Sydney Coastal Dry Sclerophyll Forests, Dry Rainforests, Subtropical Rainforests, Western Vine Thickets, North Coast Wet Sclerophyll Forests and Northern Escarpment Wet Sclerophyll Forests.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area.
Solanum celatum	E1	-	Species		Medium sized erect shrub restricted to an area from Wollongong to just south of Nowra and west to Bungonia. Found growing on hills, slopes, disturbed sites and rainforest clearings in Central Gorge Dry Sclerophyll Forests, Dry Rainforests and North Coast Wet Sclerophyll Forests.	0	Low – BAM candidate species. No records within 10km of the study area. Vegetation within the study area is unlikely to provide suitable habitat within the study area. Restricted to an area from Wollongong to just south of Nowra, and west to Bungonia.
Syzygium paniculatum Magenta Lilly Pilly	E1	VU	Species	Grows on grey sandy, gravelly, silty or clay soils over sandstone substrates.	Small to medium sized rainforest tree restricted to a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. Found growing on stabilized dunes near the sea in South Coast Sands Dry Sclerophyll Forests, Coastal Swamp Forests, Coastal Headland Heaths, Littoral Rainforests, Northern Hinterland Wet Sclerophyll Forests and Southern Lowland Wet Sclerophyll Forests.	1 - BioNet	Low – BAM candidate species. Only one record within 10km. Vegetation within the study area is unlikely to provide suitable habitat.

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Tetratheca glandulosa	VU	-	Species	Grows in the shallow, yellow clay/sandy loams that are typical of shale/sandstone transition soils where shale caps occur over sandstone substrates such as the Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes.	Small, spreading shrub with 150 populations confined to the Baulkham Hills, Gosford, Hawkesbury, Ku-ring-gai, Pittwater, Ryde and Wyong Local Government Areas. Found growing in a variety of communities including Sydney Sandstone Ridgetop Woodland, Sydney Coastal Dry Sclerophyll Forests, Eastern Riverine Forests, Coastal Valley Grassy Woodlands, Sydney Montane Heaths and North Coast Wet Sclerophyll Forests.	1 - BioNet	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat in October. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip, which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Thelymitra kangaloonica Kangaloon Sun Orchid	E4A	CE	Species	Occurs in or within 200 m of swamps. Grows in grey silty or grey loam soils.	Terrestrial orchid confined to the southern tablelands in the Moss Vale, Kangaloon, Fitzroy Falls area with the majority growing on land managed by the Sydney Catchment Authority. Found growing in swamps and sedgelands at elevations between 550 and 700 metres in Temperate Highland Peat Swamps on Sandstone, Coastal Heath Swamps and Montane Bogs and Fens. A cryptic species which is most visible when flowering between late October and early November.	0	Unlikely – Not a BAM candidate species. Low abundance of records of the species occurs within 10km. Suitable habitat is absent from the study area. Populations of this species are generally restricted to the Southern Tablelands.
Thesium australe Austral Toadflax	VU	VU	Species		Small, straggling herb with a distribution comprising of small populations scattered along the coast of eastern NSW including the Northern and Southern Tablelands, Tasmania, Queensland and eastern Asia. A root parasite found growing on damp sites in grassland, grassy woodlands and coastal headlands	0	Moderate – BAM candidate species. Suitable habitat present. Low abundance of records of the occur within 10km of the study area. Targeted surveys within the proposal site were completed in areas suitable habitat in December. However, vegetation within Lot 18 in DP251051 was not surveyed due to access constraints. Lot 18 exists as a thin linear strip,

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
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					often in association with Kangaroo Grass *Themeda triandra* in a variety of communities including New England Dry Sclerophyll Forests, Western Slopes Grasslands, Northern Tableland Wet Sclerophyll Forests, Brigalow Clay Plain Woodlands, Subalpine Woodlands and Maritime Grasslands.		which is primarily present in a degraded state and is therefore not considered to provide suitable habitat. Surveys were also completed within the road reserve adjacent to Lot 18, with visual surveys being completed where appropriate. With this in consideration, the presence of the species within these unsurveyed areas specifically is considered unlikely.
Wahlenbergia multicaulis - endangered population	E2	-	-	Grows on poorly drained, yellow podzolic soils interspersed with concretionary ironstone such as the Villawood soil series or Hawkesbury soil landscape.	Medium sized, perennial tufted herb confined to 13 sites located at Thornleigh, Mount Ku-ring-gai, Rookwood, Chullora, Bass Hill, Bankstown, Georges Hall, Campsie, South Granville and Greenacre. Found growing in forests, woodlands, grasslands, wetlands, adjacent to watercourses and disturbed sites in a variety of communities including Sandstone Gully Forest, Cooks River / Castlereagh Ironbark Forest, Cumberland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Valley Grassy Woodlands and Southern Lowland Wet Sclerophyll Forests.	0	Unlikely – Not a BAM candidate species. No records occur within 10km of the study area. Endangered population is only relevant to the local government areas of Auburn, Bankstown, Baulkham Hills, Canterbury, Hornsby, Parramatta and Strathfield.
Xerochrysum palustre	-	VU	Species	Grows in cracking black clay soils.	Small erect herb, endemic to south-eastern Australia with a distribution spanning south-eastern NSW through Victoria to north-eastern Tasmania. Found growing at elevations of up to 1300 metres although more commonly found at elevations under 500 metres in lowland swamps.	0	Unlikely – Not a BAM candidate species. Low abundance of records of the species occurs within 10km. Suitable habitat is absent from the study area. Populations of this species are found only in Kosciuszko National Park and the eastern escarpment south of Badja
Zieria granulata	E1	EN	Species	Grows in shallow, volcanic soils on Bumbo latite or on	Tall, bushy shrub restricted to the Illawarra region where it is recorded from a number of sites spanning from Oak Flats and Toolijooa to	0	Unlikely – Not a BAM candidate species. Low abundance of records of the species occurs within 10km. Suitable habitat is absent from the study area.

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				Quaternary sediments.	Shellharbour and Kiama. Found growing on dry ridge tops and rocky outcrops as well as disturbed areas such as roadside verges in Coastal Valley Grassy Woodlands, Southern Montane Heaths. Dry Rainforests, Southern Warm Temperate Rainforests, Subtropical Rainforests, Southern Tableland Wet Sclerophyll Forests and North Coast Wet Sclerophyll Forests.		
Zieria involucrata	E1	VU	Species	Grows on Hawkesbury or Narrabeen sandstone or Quaternary alluvium substrates.	Small, erect shrub with a disjunct distribution north and west of Sydney in the Baulkham Hills, Hawkesbury, Hornsby and Blue Mountains Local Government Areas primarily in the Macdonald, Colo, and Hawkesbury River Catchments. Found growing on mid to lower slopes and valleys or adjacent to gullies in Sydney Coastal Dry Sclerophyll Forests, Sydney Hinterland Dry Sclerophyll Forests, Southern Lowland Wet Sclerophyll Forests and North Coast Wet Sclerophyll Forests.	0	Unlikely – Not a BAM candidate species. Low abundance of records of the species occurs within 10km. Suitable habitat is absent from the study area.
Birds							
Actitis hypoleucos Common Sandpiper	-	Mi	-		Inhabits a wide range of coastal and inland wetlands, often with muddy or rocky margins. Also known to occur at estuaries, billabongs, dams, pools and lakes, often associated with mangroves.	0	Unlikely - Not a BAM candidate species. No records present within 10km of the study area. This species is a highly mobile, migratory species, typically associated with coastal waterways. Typical habitat is not present as waterways within the study area are inland and in a highly degraded state, lacking surrounding vegetation.
Anthochaera phrygia Regent Honeyeater	CR	CR	Ecosystem		Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-	5 - BioNet	Low - Not a BAM candidate species Few records present within 10km of the study area. Study area does not contain any important habitat mapping for the species. Higher quality habitat

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					ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten. This species usually nests in tall mature eucalypts and sheoaks.		available within contiguous sections of vegetation surrounding the study area.
Apus pacificus Fork-tailed Swift	-	Mi	-		Almost exclusively aerial (foraging). The Fork-tailed Swift breeds in Asia but migrates to Australia from September to April. Individuals or flocks can be observed hawking for insects at varying heights from only a few metres from the ground and up to 300 metres high.	2 - BioNet	Low - Not a BAM candidate species. Few records present within 10km of the study area. Highly mobile migratory species. Higher quality habitat available within contiguous sections of vegetation surrounding the study area.
Artamus cyanopterus cyanopterus Dusky Woodswallow	VU	-	Ecosystem		Primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and groundcover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	38 - BioNet	Moderate - Not a BAM candidate species Relatively high number of records. The study area provides minimal foraging habitat, in areas of remnant vegetation connected via corridors to larger sections of intact vegetation.
Botaurus poiciloptilus Australasian Bittern	EN	EN	Ecosystem	Occurs near brackish or freshwater wetlands.	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation including *Typha* spp. and *Eleocharis* spp.. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense	1 - BioNet	Low- Not a BAM candidate species few records present within 10km of the study area. This species is a highly mobile, migratory species, typically associated with coastal waterways. Typical habitat is not present as waterways within the study area are inland and in a highly degraded state, lacking surrounding vegetation.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
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					vegetation on a flattened platform of reeds.		
Burhinus grallarius Bush Stone-curlew	EN	-	Species	Occurs in habitats associated with fallen or standing dead timber such as logs.	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east, it is either rare or extinct throughout its former range. Occurs in lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present.	2 - BioNet	Lo – BAM candidate species. Few records present within 10km of the study area. Higher quality habitat available within contiguous sections of vegetation surrounding the study area. Not recorded during targeted surveys.
Calidris acuminata Sharp-tailed Sandpiper	-	Mi	-		This species is a migratory visitor to Australia, and spends its breeding season in Siberia. In the non-breeding season, the Sharp-tailed Sandpiper is known to occur mostly in the south-east of Australia, but has been found on coastlines all throughout the country.	0	Low- Not a BAM candidate species. No records present within 10km of the study area. This species is a highly mobile, migratory species, typically associated with coastal waterways. Typical habitat is not present as waterways within the study area are inland and in a highly degraded state, lacking surrounding vegetation.
Calidris ferruginea Curlew Sandpiper	EN	CR, Mi	Dual Credit	Mapped important areas.	Inhabits sheltered intertidal mudflats. Also, non-tidal swamps, lagoons and lakes near the coast. Infrequently recorded inland.	0	Low- Not a BAM candidate species. No records present within 10km of the study area. Typical habitat not present as waterways within the study area are highly degraded and lacking vegetation. This species is also typically associated with coastal waterways.
Calidris melanotos Pectoral Sandpiper	-	Mi	-		Scarce, but regular visitor, usually recorded in summer from November to March. Widespread but scattered records in Australia. Usually found in fresh to saline wetlands, floodplains, swamps, estuaries and lagoons, sometimes with emergent or fringing vegetation such as grass.	0	Low- Not a BAM candidate species. No records present within 10km of the study area. This species is a highly mobile, migratory species, typically associated with coastal waterways. Typical habitat is not present as waterways within the study area are inland and in a highly degraded state, lacking surrounding vegetation.

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Callocephalon fimbriatum Gang-gang Cockatoo	VU	EN	Ecosystem	Found in habitats containing Eucalypts trees bearing hollows greater than 9cm in diameter.	In summer, 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, occurs at lower altitudes in drier, more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. It requires tree hollows in which to breed.	38 - BioNet	Low – BAM candidate species. Despite numerous records for the species being present within the study area, targeted surveys were completed and did not detect the species.
Calyptorhynchus lathami Glossy Black-Cockatoo	VU	-	Ecosystem	Found in habitats containing *Allocasuarina* or *Casuarina* sp. These birds are reliant on hollows in these trees which are both greater than 15cm in diameter, and greater than 8m from the ground.	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.	45 - BioNet	Moderate- BAM candidate species. Despite numerous records for the species being present within the study area, targeted surveys were completed and did not detect the species. It should be mentioned that chewed cones were found, however this only indicates a probable sighting which cannot be confirmed
Chthonicola sagittata Speckled Warbler	VU	-	Ecosystem		*Chthonicola sagittata* occurs on the hills and tablelands of the Great Dividing Range. Found in eucalypt and cypress woodlands with a grassy understorey, often on ridges or gullies. The species nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground for arthropods and seeds.	4 - BioNet	Low- Not a BAM candidate species. Few records present within 10km of the study area. Vegetation within the study area is highly degraded and this species requires large undisturbed areas of remnant vegetation.
Circus assimilis Spotted Harrier	-	VU	Ecosystem		The Spotted Harrier is found throughout Australia but rarely in densely forested and wooded habitat of the escarpment and coast. Preferred habitat consists of open and wooded country with grassland	0 - BioNet	Low- Not a BAM candidate species. No records present within 10km of the study area. Higher quality habitat available within contiguous sections of vegetation surrounding the study area. Not recorded during targeted surveys.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
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					nearby for hunting. Habitat types include open grasslands, acacia and mallee remnants, spinifex, open shrublands, saltbush, very open woodlands, crops and similar low vegetation. The Spotted Harrier is more common in drier inland areas, nomadic part migratory and dispersive, with movements linked to the abundance of prey species. Nesting occurs in open or remnant woodland and unlike other harriers, the Spotted Harrier nests in trees.		
Climacteris picumnus victoriae Brown Treecreeper (eastern subspecies)	VU	VU	Ecosystem		Lives in eucalypt woodlands, especially areas of relatively flat open woodland typically lacking a dense shrub layer, with short grass or bare ground and with fallen logs or dead trees present.	21 - BioNet	Low- Not a BAM candidate species. Habitat within the study area that is associated with this species is of a degraded condition. Higher quality vegetation is present within contiguous areas outside the study area. Targeted surveys were also completed and did not detect the species.
Daphoenositta chrysoptera Varied Sittella	VU	-	Ecosystem		The Varied Sittella is a sedentary species which inhabits a wide variety of dry eucalypt forests and woodlands, usually with either shrubby understorey or grassy ground cover or both, in all climatic zones of Australia. Usually inhabit areas with rough-barked trees, such as stringybarks or ironbarks, but also in mallee and acacia woodlands, paperbarks or mature Eucalypts. The Varied Sittella feeds on arthropods gleaned from bark, small branches and twigs. It builds a cup-shaped nest of plant fibres and cobweb in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	65 - BioNet	Low- Not a BAM candidate species. Habitat within the study area that is associated with this species is of a degraded condition. Higher quality vegetation is present within contiguous areas outside the study area. Targeted surveys were also completed and did not detect the species.
Falco hypoleucos Grey Falcon	EN	VU	Ecosystem		Found over open country and wooded lands of tropical and temperate Australia. Mainly found	0	Low - Not a BAM candidate species. No records present within 10km of the study area. Species is highly mobile and referred habitat is not present

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub.		within the study area. The study area is also not within the species known and predicted range.
Falco subniger Black Falcon	VU	-	Ecosystem		Mainly occur in woodlands and open country where can hunt. Often associated with swamps, rivers and wetlands. Nest in tall trees along watercourses.	2 - BioNet	Low. Not a BAM candidate species. Few records present within 10km of the study area. This species is highly mobile and the preferred habitat is not present within the study area.
Falsistrellus tasmaniensis Eastern False Pipistrelle	-	VU	Ecosystem		Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs, and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha. Records show movements of up to 12 km between roosting and foraging sites.	0	Recorded – This species was recorded during targeted surveys.
Gallinago hardwickii Latham's Snipe	-	Mi	-		Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams.	0	Low - Not a BAM candidate species. No records present within 10km of the study area. This species is a highly mobile, migratory species. Typical habitat is not present as waterways within the study area in a highly degraded state, lacking surrounding vegetation.
Glossopsitta pusilla Little Lorikeet	VU	-	Ecosystem		Distributed in forests and woodlands from the coast to the western slopes of the Great Dividing Range in NSW, extending westwards to the vicinity of Albury, Parkes, Dubbo, and	61 - BioNet	Recorded – This species was recorded during targeted surveys.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Narrabri. Mostly occur in dry, open eucalypt forests and woodlands. They feed primarily on nectar and pollen in the tree canopy. Nest hollows are located at heights of between 2 m and 15 m, mostly in living, smooth-barked eucalypts. Most breeding records come from the western slopes.		
Grantiella picta Painted Honeyeater	VU	VU	Ecosystem	Present at a density of greater than five mistletoes per hectare.	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.	0	Low. Not a BAM candidate species. Habitat present is of a mostly degraded nature and no records present within 10km of the study area.
Haliaeetus leucogaster White-bellied Sea-Eagle	VU	-	Ecosystem	Occurs within 1km of waterbodies such as rivers, lakes, large dams, creeks and coastlines. Reliant on mature trees (either living or dead), within suitable vegetation.	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	14 - BioNet	Low – BAM candidate species.Habitat within the study area that is associated with this species is of a degraded condition. Higher quality vegetation is present within contiguous areas outside the study area. Targeted surveys were also completed and did not detect the species.
Hieraaetus morphnoides Little Eagle	VU	-	Ecosystem	Reliant on large old trees (usually live), surrounded by suitable vegetation.	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	25 - BioNet	Low – BAM candidate species. Habitat within the study area that is associated with this species is of a degraded condition. Higher quality vegetation is present within contiguous areas outside the study area. Targeted surveys were also completed and did not detect the species.
Hirundapus caudacutus White-throated Needletail	-	VU, Mi	Ecosystem		An aerial species found in feeding concentrations over cities, hilltops and timbered ranges. Breeds in Asia.	7 - BioNet	Low. Not a BAM candidate species. Few records present within 10km of the study area. This

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
							species is highly mobile and the preferred habitat is not present within the study area.
Ixobrychus flavicollis Black Bittern	VU	-	Ecosystem	Occurs within 4m of freshwater and estuarine wetlands, in areas of permanent water and dense vegetation.	The Black Bittern is found along the coastal plains within NSW, although individuals have rarely being recorded south of Sydney or inland. It inhabits terrestrial and estuarine wetlands such as flooded grasslands, forests, woodlands, rainforests and mangroves with permanent water and dense waterside vegetation. The Black Bittern typically roosts on the ground or in trees during the day and forages at night on frogs, reptiles, fish and invertebrates. The breeding season extends from December to March. Nests are constructed of reeds and sticks in branches overhanging the water.	1 - BioNet	Low. Not a BAM candidate species. Only one record present within 10km of the study area. This species is a highly mobile, migratory species, typically associated with coastal waterways. Typical habitat is not present as waterways within the study area are inland and in a highly degraded state, lacking surrounding vegetation.
Lathamus discolor Swift Parrot	EN	CR	Ecosystem	Mapped important areas.	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. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	7 - BioNet	Low - Few records present within 10km of the study area. Not a BAM candidate species due to habitat constraints (habitat is not within the mapped important areas)

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Lophoictinia isura Square-tailed Kite	VU	-	Ecosystem	Reliant on large trees for nesting.	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by *Eucalyptus longifolia, Corymbia maculata, E. elata,* or *E. smithii*. Individuals appear to occupy large hunting ranges of more than 100 km^2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near watercourses, in a tree fork or on large horizontal limbs.	17 - BioNet	Low – BAM candidate species. Habitat within the study area that is associated with this species is of a degraded condition. Higher quality vegetation is present within contiguous areas outside the study area. Targeted surveys were also completed and did not detect the species.
Melanodryas cucullata cucullata Hooded Robin (south-eastern form)	VU	-	Ecosystem		This species lives in a wide range of temperate woodland habitats, and a range of woodlands and shrublands in semi-arid areas.	3 - BioNet	Low- Not a BAM candidate species. Habitat within the study area that is associated with this species is of a degraded condition. Higher quality vegetation is present within contiguous areas outside the study area. Targeted surveys were also completed and did not detect the species.
Melithreptus gularis gularis Black-chinned Honeyeater (eastern subspecies)	VU	-	Ecosystem	It is rarely recorded east of the Great Dividing Range.	Found mostly in open forests and woodlands dominated by box and ironbark eucalypts.	8 - BioNet	Low. Not a BAM candidate species. Few records occur with 10km of the study area. Unlikely to be present on the east side of the Great Dividing Range.
Motacilla flava Yellow Wagtail	-	Mi	-		Regular spring-summer visitor in north of Australia, rare vagrant or occasional visitor farther south. Found in marshes, damp paddocks, airfields, cultivated fields, lawns and estuaries.	0	Low. Not a BAM candidate species. No records present within 10km of the study area. This species is a highly mobile, migratory species, Habitat present in a highly degraded state, lacking surrounding vegetation.
Neophema pulchella Turquoise Parrot	VU	-	Ecosystem		Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs. Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies. Nest in hollow-bearing trees,	4 - BioNet	Low- Not a BAM candidate species. Habitat within the study area that is associated with this species is of a degraded condition. Higher quality vegetation is present within contiguous areas outside the study area. Targeted surveys were also completed and did not detect the species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies that are moist.		
Ninox connivens Barking Owl	VU	-	Ecosystem	Reliant on living or dead trees bearing hollows greater than 20cm in diameter and greater than 4m above the ground.	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	3 - BioNet	Low – BAM candidate species. Habitat is present in a degraded state and targeted bird surveys did not detect the species.
Ninox strenua Powerful Owl	VU	-	Ecosystem	Reliant on living or dead trees which bear hollows greater than 20cm in diameter.	The Powerful Owl occupies wet and dry eucalypt forests and rainforests. It may inhabit both un-logged and lightly logged forests as well as undisturbed forests where it usually roosts on the limbs of dense trees in gully areas. Large mature trees with hollows at least 0.5 m deep are required for nesting. Tree hollows are particularly important for the Powerful Owl because a large proportion of the diet is made up of hollow-dependent arboreal marsupials. Nest trees for this species are usually emergent with a diameter at breast height of at least 100 cm. It has a large home range of between 450 and 1450 ha.	35 - BioNet	Low- BAM candidate species. Habitat is present in a degraded state and bird surveys did not detect the species.
Numenius madagascariensis Eastern Curlew	-	CR, Mi	Dual Credit	Mapped important areas.	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats often with beds of seagrass.	0	Low. Not a BAM candidate species. No records present within 10km of the study area. Optimal habitat is closer to the coast.
Onychoprion fuscata Sooty Tern	VU	-	Species		The Sooty Tern is a pelagic species found over tropical waters were it feeds offshore far away from land. It	1 - BioNet	Low. Not a BAM candidate species. Few records present within 10km of the study area.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					breeds off the coast of WA and QLD rarely venturing to the south-east of Australia.		
Pandion cristatus Eastern Osprey	VU	Mi	Dual Credit	Reliant on stick-nests in living and dead trees that are greater than 15m tall. Nesting typically occurs within 1km of a floodplain.	Found in coastal waters, inlets, estuaries and offshore islands. Occasionally found 100 km inland along larger rivers. It is water-dependent, hunting for fish in clear, open water. The Osprey occurs in terrestrial wetlands, coastal lands and offshore islands. It is a predominantly coastal species, generally using marine cliffs as nesting and roosting sites. Nests can also be made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea.	0	Low. Not a BAM candidate species. No records present within 10km of the study area. Bird surveys did not detect the species.
Petroica boodang Scarlet Robin	VU	-	Ecosystem		The Scarlet Robin inhabits dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. During autumn and winter, it moves to more open and cleared areas. The Scarlet Robin forages amongst logs and woody debris for insects. The nest is an open cup of plant fibres and cobwebs, sited in the form of a tree.	29 - BioNet	Low. Not a BAM candidate species. Bird surveys did not detect the species.
Petroica phoenicea Flame Robin	VU	-	Ecosystem		Flame Robins are found in a broad coastal band from southern Queensland to just west of the South Australian border. The preferred habitat in summer includes moist eucalyptus forests and open woodlands, in winter prefers open woodlands and farmlands. It is considered migratory. Diet consists mainly of invertebrates.	1 - BioNet	Low. Not a BAM candidate species. Few records present within 10km of the study area. Bird surveys did not detect the species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Ptilinopus superbus Superb Fruit-Dove	-	VU	Ecosystem		The Superb Fruit Dove ranges from northern NSW to as far south as Moruya. It is found in rainforests, closed forests (including mesophyll vine forests) and sometimes in eucalypt and acacia woodlands with fruit-bearing trees. It forages in the canopy of fruiting trees such as figs and palms.	0	Low- Not a BAM candidate species. No records present within 10km of the study area. Suitable foraging and breeding habitat is not present within the study area.
Pycnoptilus floccosus Pilotbird	-	VU	-		The pilotbird is found from the Wollemi National Park and Blue Mountains National Park in New South Wales through to the Dandenong Ranges, near Melbourne in Victoria. Its natural habitat is temperate wet sclerophyll forests and occasionally temperate rainforest, where there is dense undergrowth with abundant debris. [ALA 2022]	1 - BioNet	Low. Not a BAM candidate species. Few records present within 10km of the study area. Suitable foraging and breeding habitat is not present within the study area
Rostratula australis Australian Painted Snipe	EN	EN	Ecosystem		Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps, and waterlogged grassland. They prefer freshwater wetlands but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects, and some plant-matter.	0	Low. Not a BAM candidate species. No records present within 10km of the study area.
Stagonopleura guttata Diamond Firetail	VU	VU	Ecosystem		The Diamond Firetail is widely distributed, found in a range of habitat types including open eucalypt forest, mallee and acacia scrubs. Often occur in vegetation along watercourses. Feeds exclusively on the ground on ripe grass and herb seeds, green leaves and insects.	13 - BioNet	Low. Not a BAM candidate species. Few records present within 10km of the study area. Diurnal bird survey repeated twice and did not detect the species.
Sternula albifrons Little Tern	EN	Mi	Dual Credit		The Little Tern favours sheltered coasts, harbours, bays, lakes, inlets,	1 - BioNet	Low- Not a BAM candidate species. Minimal records present within 10km of the study area.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					estuaries, coastal lagoons and ocean beaches especially with sand-spits and sand islets. It forages over shallow waters close inshore or over sandbars and reefs.		This species is a highly mobile, migratory species, typically associated with coastal waterways. Typical habitat is not present as waterways within the study area are inland from the coast.
Tyto novaehollandiae Masked Owl	VU	-	Ecosystem	Found in habitats containing living or dead trees bearing hollows greater than 2cm in diameter.	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	3 - BioNet	Recorded – This species was incidentally recorded during targeted surveys. However, no breeding/roosting habitat for the species was detected during survey which included searches of hollows suitable for use by Masked Owl as well as searches for signs of roosting Owls such as presence of pellets, whitewash and prey remains.
Tyto tenebricosa Sooty Owl	-	VU	Ecosystem	Closely associated with habitats containing caves, cliff lines and ledges. Also reliant on living or dead trees which bear hollows greater than 20cm in diameter.	The Sooty Owl is often found in tall old-growth forests, including temperate and subtropical rainforests. It is mostly found on escarpments with a mean altitude <500 m. This species nests and roosts in hollows of emergent trees, mainly eucalypts often located in gullies.	0	Low- Not a BAM candidate species No species recorded within 10km of the study area. Suitable habitat is not present within the study area.
Mammals							
Cercartetus nanus Eastern Pygmy-possum	VU	-	Species	Mapped important areas.	Patchily distributed from the coast to the Great Dividing Range, and as far as Pillaga, Dubbo, Parkes and Wagga Wagga on the western slopes. Inhabits rainforest through to sclerophyll forest and tree heath. Banksias and myrtaceous shrubs and trees are a favoured food source. Soft fruits are eaten when flowers are unavailable and it also feeds on insects. Will often nest in tree hollows, but can also construct its own nest. Because of its small size it is able to utilise a range of hollow sizes including very small hollows.	9 - BioNet	Low- BAM candidate species Habitat within the study area is of a degraded condition and targeted surveys did not detect the species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Individuals will use a number of different hollows and an individual has been recorded using up to 9 nest sites within a 0.5 ha area over a 5 month period.		
Chalinolobus dwyeri Large-eared Pied Bat	VU	VU	Species	Found within 2km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2km of old mines or tunnels.	Occurs from the Queensland border to Ulladulla, with largest numbers from the sandstone escarpment country in the Sydney Basin and Hunter Valley. Primarily found in dry sclerophyll forests and woodlands, but also found in rainforest fringes and subalpine woodlands. Forages on small, flying insects below the forest canopy. Roosts in colonies of between three and 80 in caves, Fairy Martin nests and mines, and beneath rock overhangs, but usually less than 10 individuals. Likely that it hibernates during the cooler months. The only known existing maternity roost is in a sandstone cave near Coonabarabran.	37 - BioNet	Recorded – This species was recorded during targeted surveys. Note* No breeding habitat identified
Dasyurus maculatus Spotted-tailed Quoll	VU	EN	Ecosystem		Occurs along the east coast of Australia and the Great Dividing Range. 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.	7 - BioNet	Low- Not a BAM candidate species This species has had a low amount of records within 10km of the study area. Potential habitat for this species is not available within the study area which includes large areas of intact vegetation. Targeted surveys did not detect the species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					Individuals require large areas of relatively intact vegetation through which to forage. The home range of a female is between 180 and 1000 ha, while males have larger home ranges of between 2000 and 5000 ha. Breeding occurs from May to August.		
Falsistrellus tasmaniensis Eastern False Pipistrelle	VU	-	Ecosystem		Distribution extending east of the Great Dividing Range throughout the coastal regions of NSW, from the Queensland border to the Victorian border. Prefers wet high-altitude sclerophyll and coastal mallee habitat, preferring wet forests with a dense understorey but being found in open forests at lower altitudes. Apparently hibernates in winter. Roosts in tree hollows and sometimes in buildings in colonies of between 3 and 80 individuals. Often change roosts every night. Forages for beetles, bugs and moths below or near the canopy in forests with an open structure, or along trails. Has a large foraging range, up to 136 ha. Records show movements of up to 12 km between roosting and foraging sites.	9 - BioNet	Recorded – This species was recorded during targeted surveys.
Isoodon obesulus obesulus Southern Brown Bandicoot (eastern)	EN	EN	Species	Requires dense ground cover in a variety of habitats.	This species prefers sandy soils with scrubby vegetation and/or areas with low ground cover that are burn from time to time. A mosaic of post fire vegetation is important for this species.	0	Low- Not a BAM candidate species No records of this species within 10km. Vegetation largely lacks an appropriate understorey. Targeted surveys did not detect the species.
Micronomus norfolkensis Eastern Coastal Free-tailed Bat	VU	-	Ecosystem		Distribution extends east of the Great Dividing Range from southern Queensland to south of Sydney. Most records are from dry eucalypt forests and woodland. Individuals	13 - BioNet	Recorded – This species was recorded during targeted surveys.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					tend to forage in natural and artificial openings in forests, although it has also been caught foraging low over a rocky river within rainforest and wet sclerophyll forest habitats. The species generally roosts in hollow spouts of large mature eucalypts (including paddock trees), although individuals have been recorded roosting in the roof of a hut, in wall cavities, and under metal caps of telegraph poles. Foraging generally occurs within a few kilometres of roosting sites.		
Miniopterus australis Little Bent-winged Bat	VU	-	Ecosystem	Caves, tunnels, mines, culverts, or other structures known or suspected to be used for breeding.	Occurs from Northern Queensland to the Hawkesbury River near Sydney. Roost sites encompass a range of structures including caves, tunnels, and stormwater drains. Young are raised by the females in large maternity colonies in caves in summer. Shows a preference for well-timbered areas including rainforest, wet and dry sclerophyll forests, Melaleuca swamps and coastal forests. The Little Bent-winged bat forages for small insects (such as moths, wasps and ants) beneath the canopy of densely vegetated habitats.	13 - BioNet	Recorded – This species was recorded during targeted surveys.
Miniopterus orianae oceanensis Large Bent-winged Bat	VU	-	Ecosystem	Caves, tunnels, mines, culverts, or other structures known or suspected to be used for breeding.	Occurs from Victoria to Queensland, on both sides of the Great Dividing Range. Forms large maternity roosts (up to 100,000 individuals) in caves and mines in spring and summer. Individuals may fly several hundred kilometres to their wintering sites, where they roost in caves, culverts, buildings, and bridges. They occur in a broad range of habitats including	27 - BioNet	Recorded – This species was recorded during targeted surveys

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					rainforest, wet and dry sclerophyll forest, paperbark forest and open grasslands. Has a fast, direct flight and forages for flying insects (particularly moths) above the tree canopy and along waterways.		
Myotis macropus Southern Myotis	VU	-	Species	Utilises hollow-bearing trees within 200m of riparian zones. Also known to roost under bridges, and in caves or artificial structures close to riparian areas.	Scattered, mainly coastal distribution extending to South Australia along the Murray River. Roosts in caves, mines, or tunnels, under bridges, in buildings, tree hollows, and even in dense foliage. Colonies occur close to water bodies, ranging from rainforest streams to large lakes and reservoirs. They catch aquatic insects and small fish with their large hind claws, and catch flying insects.	39 - BioNet	Recorded – This species was recorded during targeted surveys
Petauroides volans Greater Glider	-	VU	Species	Reliant on hollow-bearing trees.	The distribution of the Greater Glider includes the ranges and coastal plain of eastern Australia, where it inhabits a variety of eucalypt forests and woodlands. Presence and density of Greater Gliders is related to soil fertility, eucalypt tree species, disturbance history and density of suitable tree hollows. Feeds exclusively on eucalypt leaves, buds, flowers, and mistletoe.	22 - BioNet	Low- BAM candidate species. Habitat within the study area that is associated with this species is in a degraded condition. Targeted surveys did not detect the species.
Petaurus australis Yellow-bellied Glider	VU	VU	Ecosystem		Restricted to tall native forests in regions of high rainfall along the coast of NSW. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types.	3 - BioNet	Low. Not a BAM candidate species. Few records within 10 km of the study area. Habitat within the study area that is associated with this species is of a degraded condition.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Petaurus norfolcensis Squirrel Glider	VU	-	Species		Generally, occurs in dry sclerophyll forests and woodlands but is absent from dense coastal ranges in the southern part of its range. Requires abundant hollow-bearing trees and a mix of eucalypts, banksias and acacias. Within a suitable vegetation community at least one species should flower heavily in winter and one species of eucalypt should be smooth barked.	10 - BioNet	Low- BAM candidate species. Few records occur in the landscape. Habitat present is of a degraded condition and targeted surveys did not detect the species.
Petrogale penicillata Brush-tailed Rock-wallaby	EN	VU	Species	Land within 1km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or cliff lines.	Occurs along the Great Dividing Range south to the Shoalhaven, and also occurs in the Warrumbungle and Mt Kaputar. Habitats range from rainforest to open woodland. It is found in areas with numerous ledges, caves and crevices particularly with northern aspects. The species forages on grasses and forbs.	1 - BioNet	Low- not a BAM candidate species. No suitable rock ledges, caves or outcrops to support this species. Not a BAM candidate species.
Phascolarctos cinereus Koala	VU	EN	Dual Credit	Areas identified via survey as important habitat (see comments).	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. Primary feed trees include *Eucalyptus robusta*, *E. tereticornis, E. punctata, E. haemastoma* and *E. signata*. They are solitary with varying home ranges.	1167 - BioNet	Recorded – This species was recorded during targeted surveys.
Pseudomys novaehollandiae New Holland Mouse	-	VU	Ecosystem		The New Holland Mouse currently has a disjunct, fragmented distribution across Tasmania, Victoria, New South Wales and Queensland. Across the species' range the New Holland Mouse is known to inhabit open heathlands, open woodlands with a heathland	0 - BioNet	Low. Not a BAM candidate species. No records within 10km. Not a BAM candidate species. Vegetation present does not provide potential habitat for this species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					understorey, and vegetated sand dunes. The home range of the New Holland Mouse can range from 0.44 ha to 1.4 ha. The New Holland Mouse is a social animal, living predominantly in burrows shared with other individuals. The species is nocturnal and omnivorous, feeding on seeds, insects, leaves, flowers, and fungi, and is therefore likely to play an important role in seed dispersal and fungal spore dispersal. It is likely that the species spends considerable time foraging above-ground for food, predisposing it to predation by native predators and introduced species. Breeding typically occurs between August and January but can extend into autumn.		
Pteropus poliocephalus Grey-headed Flying-fox	VU	VU	Ecosystem	Form large breeding camps which fluctuate in numbers throughout the year.	Occurs along the NSW coast, extending further inland in the north. This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, melaleuca swamps and banksia woodlands. Roosts in large colonies, commonly in dense riparian vegetation.	98 - BioNet	Recorded – This species was recorded during targeted surveys.
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	VU	-	Ecosystem		Found throughout NSW in habitats including wet and dry sclerophyll forest, open woodland, acacia shrubland, mallee, grasslands, and desert. They roost in tree hollows in colonies and have also been observed roosting in animal burrows, abandoned Sugar Glider nests, cracks in dry clay, hanging from buildings and under slabs of rock. Forages for insects above the canopy in forests.	5 - BioNet	Recorded – This species was recorded during targeted surveys.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Scoteanax rueppellii Greater Broad-nosed Bat	VU	-	Ecosystem	Occurs along the Great Dividing Range and in coastal areas.	Occurs in woodland and rainforest, preferring open habitats or openings in wetter forests. Often hunts along creeks or river corridors. Preys upon beetles and other large, flying insects, other bats, and spiders. Roosts in hollow tree trunks and branches.	18 - BioNet	Recorded – This species was recorded during targeted surveys.
Reptiles							
Hoplocephalus bungaroides Broad-headed Snake	EN	VU	Ecosystem	Rocky areas including escarpments, outcrops and pagodas within the Sydney Sandstone geologies.	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitats they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer.	22 - BioNet	Low. Not a BAM candidate species. No large sandstone rock outcrops present within the study area.
Varanus rosenbergi Rosenberg's Goanna	VU	-	Ecosystem	This species is a Hawkesbury/Narrabeen sandstone outcrop specialist.	Occurs in coastal heaths, humid woodlands and both wet and dry sclerophyll forests. Termite mounds are a critical habitat component.	6 - BioNet	Low. Few records within 10km. No termite mounds or large areas of intact vegetation present within the study area.
Amphibians							
Heleioporus australiacus Giant Burrowing Frog	VU	VU	Species	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks. Can also occur within shale outcrops within sandstone formations.	Known from wet and dry forests and montane woodland in the southern part range. Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water. Spends most of its time in non-breeding habitat 20-250m from breeding sites.	0	Low- not a BAM candidate species. Not a BAM candidate species. No records present within 10km of the study area. Preferred habitat of this species is not present within the study area.
Litoria aurea Green and Golden Bell Frog	EN	VU	Species	Occur in semi-permanent/ephemeral wet areas. Also found within 1km of	Most existing locations for the species occur as small, coastal, or near coastal populations, with records occurring between south of	0	Low. Not a BAM candidate species. No records present within 10km of the study area. Habitat within the study area that is associated with this species is of a degraded condition.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
				swamps and other bodies of water.	Grafton and northern VIC. The species is found in marshes, dams, and stream sides, particularly those containing bullrushes or spikerushes. Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks , although the species has also been recorded from highly disturbed areas including disused industrial sites, brick pits, landfill areas and cleared land. Breeding usually occurs in summer. Tadpoles, which take approximately 10-12 weeks to develop , feed on algae and other vegetative matter. Adults eat insects as well as other frogs, including juveniles of their own species.		
Litoria littlejohni Littlejohn's Tree Frog	VU	EN	Species	Associated with sandstone outcrops between 280 and 1000 m.	The species is distributed along the eastern slopes of the Great Dividing Range from Watagan State Forest near Wyong, south to Buchan in north-eastern VIC. It is not known from coastal habitats. Occurs in wet and dry sclerophyll forests and heath communities. Littlejohn's Tree Frog prefers permanent and semi-permanent rock flowing streams, but individuals have also been collected from semi-permanent dams with some emergent vegetation. Forages both in the tree canopy and on the ground and has been observed sheltering under rocks on high exposed ridges during summer. The species breeds in autumn but will also breed after heavy rainfall in spring and summer. The species has	44 - BioNet	Low- not a BAM candidate species. Breeding habitat is not present, and any foraging habitat is within a degraded state. Targeted surveys did not detect the species

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
					been recorded calling in all seasons with variously reported peak calling periods. Eggs are laid in loose gelatinous masses attached to submerged twigs; eggs and tadpoles are most often recorded in slow-flowing pools that receive extended exposure to sunlight.		
Litoria watsoni Watson's tree frog, Southern Heath Frog	-	EN	-	The species is found at elevations from near sea-level to 1100 m.	Watson's Tree Frog is distributed from the Budderoo National Park (NP) in south-eastern New South Wales (NSW) to the eastern side of the Snowy River NP in the East Gippsland region of Victoria.	0	Low. Not a BAM candidate species. No records present within 10km of the study area. Distribution is south of study area.
Pseudophryne australis Red-crowned Toadlet	VU	-	Species	Occurs on wetter ridge tops and upper slopes of sandstone formations.	Occurs in habitats where the predominant vegetation is dry open forests and heaths. This species typically breeds within small ephemeral creeks characterised by a series of shallow pools that feed into larger semi-perennial streams.	4 - BioNet	Low. Not a BAM candidate species. Habitat within the study area that is associated with this species is in a degraded condition.
Fish							
Macquaria australasica Macquarie Perch	-	EN	-	Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries.	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.	0	Low- not a BAM candidate species. This species is not recorded within 10km. No appropriate habitat available. No mapped key fish habitat or threatened fish distribution within the study area.
Gastropods							
Meridolum corneovirens Cumberland Plain Land Snail	EN		Species	Occurs in brackish or freshwater wetlands.	Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge.	48 - BioNet	Low- BAM candidate species. Habitat for the species occurs primarily in a degraded state. Targeted survey did not detect the species.

Scientific name	Status		BAM credit type	Habitat constraints and/or geographic limitations	Distribution and habitat	Number of records (source)	Likelihood of occurrence
	BC Act	EPBC Act					
Pommerhelix duralensis Dural Land Snail	EN	EN	Species		The species is a shale-influenced-habitat specialist, which occurs in low densities along the western and north-west fringes of the Cumberland IBRA subregion on shale-sandstone transitional landscapes.	0	Low- BAM candidate species. Habitat for the species occurs primarily in a degraded state. Targeted survey did not detect the species.
Insects							
Petalura gigantea Giant Dragonfly	EN		Species	Found in or close to swampy areas.	Live in permanent swamps and bogs with some free water and open vegetation. Adults spend most of their time settled on low vegetation on or adjacent to the swamp.	1 - BioNet	Low. Few records present within 10km of the study area. No appropriate swamp habitat available within the study area.

Appendix C: Tests of Significance (BC Act)

The following section provides for Tests of Significance according to the five factors outlined in Section 7.3 of the BC Act for all species determined as having a medium likelihood of occurrence (or greater) and may potentially be impacted by the works.

Threatened Ecological Communities

Cumberland Plain Woodland in the Sydney Basin Bioregion

The Cumberland Plain Woodland is listed as a CEEC under the BC Act. This community occupies the Cumberland Plain in western Sydney and occurs on soils derived from the Wianamatta Shale. Cumberland Plain Woodland occurs throughout the driest parts of the region, on heavy clay soils, where its canopy is dominated by Grey Box and Forest Red Gum, over a shrubby midstorey of Blackthorn and a grassy groundcover. This community provides habitat for a range of species, including the Cumberland Land Snail, which is listed as Endangered under the BC Act. This community is able to survive adverse conditions and is well adapted to drought and fire. Following European Settlement and significant growth in the Sydney region, Cumberland Plain Woodland experienced significant decline where only 7% of the community's original extent remains intact.

Cumberland Plain Woodland in the study area

Cumberland Plain Woodland aligns with PCT 849 within the study area. A total of 3.64 hectares of Cumberland Plain Woodland occurs within the proposal site, which is subject to assessment under the BC Act. Impacts under the BC Act have excluded any impacts to this CEEC within 'Certified Urban Capable Land' under the CPCP. For this assessment, the local occurrence of Cumberland Plain Woodland comprises all PCT 849 mapped within the study area and any contiguous areas of the community that extend outside the study area into the surrounding landscape.

Test of significance for Cumberland Plain Woodland
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
No applicable, not a threatened species.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: ***(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*** ***(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***
Cumberland Plain Woodland within the study area exists in several condition states including DNG, DNS , moderate and scattered trees conditional zones. This community exists in a fragmented state across the broader landscape, characterised predominantly by small, fairly isolated patches within the study area. The proposed works would impact up to 0.84 ha of this community in a derived state (DNG and DNS), 0.02 ha in a scattered trees conditional state, and 2.78 ha in a moderate condition state, totaling up to 3.64 ha. It should be mentioned that impacts primarily occur in a linear nature, predominantly affecting the edges of existing larger patches of the CEEC. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. In addition, the vegetation within the proposal site is already subject to significant disturbance and edge effects due to the existing road corridor, and farming practices in the adjacent lots. The local occurrence of Cumberland Plain Woodland includes the vegetation within the study area, as well as adjacent areas that are contiguous to that in the study area. Within the 500m buffer (assessment area), approximately 44.81 ha of this community exists. The proposed works would result in the direct removal of up to 3.64 ha of Cumberland Plain Woodland, however of this, 2.78 ha is present in moderate condition, with the remainder of the community to be impacted occurs as a derived state. The moderate condition vegetation to be removed represents approximately 6.2 % of the communities' local occurrence. With the consideration that impacts are primarily in a linear nature, the removal is not considered likely to place the local occurrence at risk of extinction.

Test of significance for Cumberland Plain Woodland
The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. The proposed works would not likely substantially modify the composition of the CEEC, as the vegetation to be removed already exists in an edge effected state with significant weed disturbance. The vegetation proposed to be removed does not comprise any ecological components critical to the survival of the broader local occurrence of this CEEC, and although the proposed works would remove 3.64 ha of this community, the composition of the remaining adjacent CEEC that extends beyond the study area is unlikely to be altered significantly by the proposed works. Additional areas of Cumberland Plain Woodland are mapped in the 500 m buffer (44.81 ha) and biotic processes such as seed dispersal would continue to occur. Therefore, the proposed works are unlikely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
In relation to the habitat of a threatened species or ecological community: ***(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*** ***(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*** ***(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.***
The proposed works would result in the direct removal of up to 3.64 ha of Cumberland Plain Woodland, however of this, 2.78 ha is present in moderate condition, with the remainder of the community to be impacted occurs as a derived state. The moderate condition vegetation to be removed represents approximately 6.2 % of the communities' local occurrence. The proposed works would involve widening of the existing road corridor to accommodate increased traffic, improve safety and increase the efficiency of freight travelling between regions. As the works involve widening of the existing road corridor, the vegetation to be removed is restricted to the area within and surrounding the road verge, on the edge of existing patches of vegetation. The removal of up to 3.64 ha of Cumberland Plain Woodland within the road verge would not divide large areas of habitat, nor would it "open up" habitat such that a patch of vegetation may become isolated from other areas habitat. This community already exists in a fairly fragmented state across the broader landscape, and impacts associated with the proposed works would not result in a substantial decrease in habitat connectivity. It is unlikely that the habitat to be removed for the proposed works is critical to the long-term survival of the CEEC. As previously mentioned, the Cumberland Plain Woodland within the study area is contiguous to vegetation of the same community existing within the surrounding area (approx. 44.81 ha within a 500 m buffer of the study area). Vegetation to be removed primarily exists on the edges of the community. Areas contiguous to that being removed would be retained post-works, and biotic processes such as seed dispersal would continue to occur. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. It is therefore unlikely that the vegetation to be removed is critical to the long-term survival of the CEEC within the locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposal would not impact on a declared area of outstanding biodiversity value (either directly or indirectly).
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works has the potential to result in the following key threatening processes (KTPs) which are considered relevant to Cumberland Plain Woodland listed under the Schedule 4 of the BC Act:

Test of significance for Cumberland Plain Woodland
• Clearing of native vegetation. • Loss of hollow-bearing trees. The proposed works would result in the removal of up to 3.64 ha of the CEEC and removal of hollow-bearing trees. Although the cumulative impacts of vegetation clearing and loss of hollows has the potential to increase the impact of the above listed KTPs, vegetation to be cleared generally has a low species diversity and high level of weed invasion, and subject to edge effects. The vegetation to be impacted also occurs in proximity to higher quality patches of vegetation within the locality which would be retained.. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities.
Conclusion.
In consideration of the above-mentioned factors, the proposed works is not likely to significantly impact Cumberland Plain Woodland within the study area or wider locality for the following reasons: • The proposed works is unlikely to significantly contribute to fragmentation of the community. • The proposed works occur in a linear nature, predominantly affecting the edges of larger patches. Hence, while these impacts may give the impression of sizeable disturbances, the removal is not substantial when considering the broader context. • The proposed works is unlikely to significantly alter the composition of the remaining areas of the CEEC. • The vegetation to be removed does not represent habitat critical to the survival of the CEEC in the locality. • The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. Therefore, no further assessment is required and a SIS or BDAR is not required.

Shale Sandstone Transition Forest in the Sydney Basin Bioregion

The Shale Sandstone Transition Forest is listed as a CEEC under the BC Act. This community occupies the edges of the Cumberland Plain on the integrate of clay soils derived from shale and sandy soils from sandstone. Shale Sandstone Transition Forest occurs throughout the southern parts of western Sydney, where only 22.6 % of its original extent remains intact. The composition of species is dependent on the soil, but typically comprises a canopy of Forest Red Gum, Grey Box, stringybarks and ironbark. The canopy may contain many additional species other than those listed, and the species composition of the understorey resembles that of Cumberland Plain Woodland in areas on clay-loam soils. This community is well adapted to fire, and prior to European settlement, this community was extensive throughout western Sydney.

Shale Sandstone Transition Forest in the study area

Shale Sandstone Transition Forest aligns with PCT 1395 within the study area. A total of 5.67 hectares of Shale Sandstone Transition Forest occurs within the proposal site, which is subject to assessment under the BC Act. Impacts under the BC Act have excluded any impacts to this CEEC within 'Certified Urban Capable Land' under the CPCP. For this assessment, the local occurrence of Shale Sandstone Transition Forest comprises all PCT 1395 mapped within the study area and any contiguous areas of the community that extend outside the study area into the surrounding landscape.

Test of significance for Shale Sandstone Transition Forest
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
No applicable, not a threatened species.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: ***(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*** ***(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.***
Shale Sandstone Transition Forest is primarily concentrated in the southern portion of the study area around the Nepean River, with scattered occurrences around the Picton Road/M31 Hume Motorway interchange. Across the locality, this community occupies the area surrounding waterways and is contiguous with parts of the CEEC within the study area. Shale Sandstone Transition Forest within the study area exists in several condition states including DNS, Low, scattered trees, moderate and high conditional zones. The proposed works would impact up to 0.04 ha of this community in a derived state (DNS), 4.21 ha in a low and scattered trees conditional state, and 1.42 ha in a moderate and high condition state, totaling up to 5.67 ha. The local occurrence of the community includes the vegetation within the study area, as well as adjacent areas that are contiguous to that in the study area. Within the 500m buffer (assessment area), approximately 171.62 ha of this community exists. The proposed works would result in the direct removal of up to 5.67 ha of Shale Sandstone Transition Forest, which represents only 3.2 % of the communities' local occurrence. In addition, the vegetation within the proposal site is already subject to significant disturbance and edge effects due to the existing road corridor, and farming practices in the adjacent lots. While the proposed works would impact 1.42 ha of moderate and high condition vegetation, the majority of vegetation (4.25 ha) to be impacted occurs as a derived or low conditional state in isolated patches across the proposal site. It should be noted that impacts primarily occur in a linear nature, predominantly affecting the edges of existing larger patches of the CEEC. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. With the consideration that impacts are primarily in a linear nature, the removal is not considered likely to place the local occurrence at risk of extinction. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. The proposed works would not substantially modify the composition of the Shale Sandstone Transition Forest CEEC within the study area. The vegetation to be removed is already subject to disturbance due to its proximity to a major roadway, therefore, the composition of the remaining adjacent CEEC that extends beyond the study area is unlikely to be altered significantly by the proposed works. While some of the Shale Sandstone Transition Forest CEEC (1.42 ha) to be removed is in a

Test of significance for Shale Sandstone Transition Forest
high to moderate condition with an intact canopy, this vegetation is concentrated within the parts of the study area near the Nepean River, where extensive areas of contiguous habitat occupy the surrounding area. The Shale Sandstone Transition Forest mapped within the open areas of the study area likely do not comprise any ecological components critical to the survival of the CEEC in the locality, due to fragmentation, low species diversity and high levels of weed invasion. In addition, the composition of the remaining CEEC that extends beyond the study area is likely to remain unchanged and biotic processes such as seed dispersal would continue to occur and the proposed works. Therefore, the proposed works are unlikely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.
In relation to the habitat of a threatened species or ecological community: ***(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*** ***(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and*** ***(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.***
The proposed works would result in the direct removal of up to 5.67 ha of potential habitat for Shale Sandstone Transition Forest, while contiguous areas of the community that extend beyond the study area (171.62 ha) would be retained. The proposed works would involve upgrades to an existing road corridor, specifically the widening of the roadway to create more lanes for increased traffic. As the works involve widening of the existing road corridor, the vegetation to be removed is restricted to the area within and surrounding the road verge, on the edge of existing patches of vegetation. The removal of up to 5.67 ha of Shale Sandstone Transition Forest within the road verge would not divide large areas of habitat, nor would it "open up" habitat such that a patch of vegetation may become isolated from other areas habitat. In addition large contiguous patches would remain intact, and the localised nature of the works would not significantly divide vegetation such that a patch of habitat may become isolated from surrounding areas of habitat, and connectivity would be maintained throughout the landscape. The Shale Sandstone Transition Forest within the proposal site is comprised of low to high condition vegetation with varying levels of disturbance. The proposed works are restricted to the road corridor and therefore, the majority of vegetation within the proposal site is subject to some level of edge effects including weed invasion. The remaining CEEC across the locality is primarily located around major waterways, particularly the Nepean River which is a major wildlife corridor, and likely provides higher quality habitat than the vegetation adjacent to Picton Road. Vegetation to be removed primarily exists on the edges of the community. Areas contiguous to that being removed would be retained post-works, and biotic processes such as seed dispersal would continue to occur. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. It is therefore unlikely that the vegetation to be removed is critical to the long-term survival of the CEEC within the locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposal would not impact on a declared area of outstanding biodiversity value (either directly or indirectly).
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposal has the potential to result in the following key threatening processes (KTPs) which are considered relevant to Shale Sandstone Transition Forest listed under the Schedule 4 of the BC Act: • Clearing of native vegetation. The proposed works would result in the removal of up to 5.67 ha of the CEEC Although the cumulative impacts of vegetation clearing has the potential to increase the impact of the above listed KTPs, vegetation to be cleared generally has a low species

Test of significance for Shale Sandstone Transition Forest
diversity and high level of weed invasion, and subject to edge effects. The vegetation to be impacted also occurs in proximity to higher quality patches of vegetation within the locality which would be retained. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities.
Conclusion.
In consideration of the above-mentioned factors, the proposed works is not likely to significantly impact Shale-Sandstone Transition Forest within the study area or wider locality for the following reasons: • The proposed works is unlikely to significantly contribute to fragmentation of the community. • The proposed works is unlikely to significantly alter the composition of the remaining areas of the CEEC. • The vegetation to be removed does not represent habitat critical to the survival of the CEEC in the locality. • The proposed works occur in a linear nature, predominantly affecting the edges of larger patches. Hence, while these impacts may give the impression of sizeable disturbances, the removal is not substantial when considering the broader context. • The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. Therefore, no further assessment is required and a SIS or BDAR is not required.

Threatened flora

Hibbertia puberula

Hibbertia puberula is listed as Endangered under the BC Act. It is a shrublet with few spreading but ultimately wiry branches that flowers from October to December, sometimes into January. This species occurs in habitats that are typically dry sclerophyll woodland communities, although heaths are also occupied on sandy soil often associated with sandstone, or on clay. *Hibbertia puberula* is widespread, but not common. It extends from Wollemi National Park south to Morton National Park and the south coast near Nowra. Early records of this species are from the Hawkesbury River area and Frenchs Forest in northern Sydney, South Coogee in eastern Sydney, the Hacking River area in southern Sydney, and the Blue Mountains. It favours low heath on sandy soils or rarely in clay, with or without rocks underneath (OEH 2019).

***Hibbertia puberula* within the study area**

Whilst *Hibbertia puberula* is a BAM candidate species, no records of this species occur within 10km from the study area, with the closet being approximately 25 km to the north. Targeted survey during the optimal survey period (October-December) was completed across the study area, however, two properties, Lot 16 in DP251051 and Lot 18 in DP251051 were not subject to targeted surveys for this species, due to access constraints. Vegetation within these lots comprises PCT 1395 and PCT 1181, which is associated with the species.

The total area of potential habitat to be impacted because of the proposed works, that was not subject to targeted surveys, is 0.52 hectares. Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether this removal is likely to lead to a significant impact *to Hibbertia puberula* is provided below.

Test of significance for *Hibbertia puberula*
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Due to access constraints, approximately 0.52 ha of vegetation, which may provide potential habitat for *Hibbertia puberula,* was not subject to targeted surveys. Therefore, it is not possible to rule out the occurrence of the species within this vegetation, and that the removal will not result in impacts towards the species. Potential impacts to *Hibbertia puberula* resulting from the proposed works are predominantly in the form of total clearing to facilitate upgrades to Picton Road. No records of the species occur within 10 km of the study area, with the closest being approximately 25 km to the north. Occurrences of this species have shown it to be widespread, but never common ((NSW Threatened Species Scientific Committee 2001). Consideration should also be made that whilst two lots (Lot 18 and 16) was not subject to targeted surveys, the remainder of areas to be impacted were surveyed, and no individuals were recorded. Whilst these lots were not surveyed, effort was made to complete visual inspections from adjacent areas where possible. The absence of recorded specimens in the surveyed area and within a 10 km radius, combined with the limited extent of un-surveyed vegetation, implies that the species is unlikely to occur within the study area. Further to this, the potential habitat that was not subject to targeted surveys is contiguous with a larger intact patch of vegetation that surrounds the riparian corridor of the Nepean River. These areas provide equally suitable habitat to that being removed and will continue to provide habitat post works. With respect to the life cycle of the species, *Hibbertia puberula* is dependent on pollinators to reproduce. The proposed works will not substantially interfere with the abundance of pollinators, which will continue to thrive in areas of adjacent vegetation. Considering the above, it is unlikely that the removal of vegetation or any potential unknown individuals during the works would have an adverse effect on the life cycle of the species, to the point where it would put a viable population at risk of extinction.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

Test of significance for *Hibbertia puberula*
(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or **(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Not applicable
In relation to the habitat of a threatened species or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**
The proposed works would remove 0.52ha of potential habitat for Hibbertia puberula, that was not subject to targeted surveys within Lots 18 and 16. However, it should be noted that the vegetation to be cleared is contiguous with a larger, well-preserved patch of vegetation that surrounds the riparian corridor of the Nepean River. Considering that the areas to be impacted within each lot are small and linear, even if unidentified individuals are affected, it is unlikely that the clearing would lead to further fragmentation or isolation of *Hibbertia puberula* habitat. Based on the absence of known records within a 10 km radius, and no known records were recorded during targeted surveys if the surrounding area, the impacts to potential habitat within Lots 18 and 16 are not considered important to the long-term survival of the species or ecological community in the locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed works would not impact on an area declared as of outstanding biodiversity value (either directly or indirectly).
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works have the potential to result in the following key threatening processes (KTPs) which are listed under the Schedule 4 of the BC Act and which are considered relevant to *Hibbertia puberula*: • Clearing of native vegetation. The proposed works would remove 0.52 ha of potential habitat for *Hibbertia puberula*, that was not subject to targeted surveys within Lots 18 and 16. Impacted vegetation is contiguous with a larger intact patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River and is therefore unlikely to increase the impact of any of the above listed KTPs. Further to this, recommendations to control weed ingress within the study area during the works have been made, and it is therefore unlikely the works would increase competition by weeds that currently operate in the study area.
Conclusion.
In consideration of the above five factors, the proposed activity is not likely to significantly impact *Hibbertia puberula* within the study area or wider locality, as: • The proposed works are unlikely to significantly alter the extent of the population to the point where it becomes locally extinct.

Test of significance for *Hibbertia puberula*
• The removal of up to 0.52 ha of vegetation would not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long-term survival in the locality. • The localised nature of the proposed works would not significantly trigger or exacerbate any key threatening processes. Therefore, no further assessment is required and a SIS or BDAR is not required.

Austral Pillwort *Pilularia novae-hollandiae*

Austral Pillwort *Pilularia novae-hollandiae*, listed endangered under the BC Act is a semi-aquatic fern that resembles a small fine grass and grows up to 8 centimetres long. Its thread-like fronds arise in tufts from a creeping underground stem (rhizome) and the fruiting capsules are small, spherical, and hairy pills that form at the base of fronds.

In New South Wales (NSW), Austral Pillwort has been recorded in suburban Sydney, Khancoban, the Riverina region between Albury and Urana, Oolambeyan National Park near Carrathool, and Lake Cowal near West Wyalong. However, the populations at Lake Cowal and Oolambeyan are the only known extant populations in NSW, although the species is obscure and has possibly been overlooked elsewhere. The species has also been recorded in the Australian Capital Territory, Victoria, Tasmania, South Australia, and Western Australia (DPIE 2018).

Austral Pillwort grows in shallow swamps and waterways, often among grasses and sedges. It is most often recorded in drying mud as this is when it is most conspicuous. The species prefers to grow in acidic soils and is often found in areas with a high-water table.

Austral Pillwort within the study area

Whilst Austral Pillwort is a BAM candidate species, no records of this species occur within 10km from the study area, with the closet being approximately 56 kilometres to the north. Targeted survey during the optimal survey period (October-December) was completed across the study area. However, two properties, Lot 16 in DP251051 and Lot 18 in DP251051 were not subject to targeted surveys for this species, due to access constraints. Vegetation within these lots comprises PCT 1395, which is associated with the species.

The total area of potential habitat to be impacted because of the proposed works, that was not subject to targeted surveys, is 0.52 hectares. Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether this removal is likely to lead to a significant impact to Austral Pillwort is provided below.

Test of significance for Austral Pillwort
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Due to access constraints, approximately 0.52 ha of vegetation, which may provide potential habitat for Austral Pillwort, was not subject to targeted surveys. Therefore, it is not possible to rule out the occurrence of the species within this vegetation, and that the removal will not result in impacts towards the species. Potential impacts to Austral Pillwort resulting from the proposed works are predominantly in the form of total clearing to facilitate upgrades to Picton Road. No records of the species occur within 10 km of the study area, with the closest being approximately 56 km to the north. Consideration should also be made that whilst two lots (Lot 18 and 16) was not subject to targeted surveys, the remainder of areas to be impacted, were surveyed, and no individuals were recorded. Whilst these lots were not surveyed, effort was made to complete visual inspections from adjacent areas where possible. The absence of recorded specimens in the surveyed area and within a 10 km radius, combined with the limited extent of un-surveyed vegetation, implies that the species is unlikely to occur within the study area. Further to this, the potential habitat that was not subject to targeted surveys is contiguous with a larger intact patch of vegetation that surrounds the riparian corridor of the Nepean River. These areas provide equally suitable habitat to that being removed and will continue to provide habitat post works.

Test of significance for Austral Pillwort
With respect to the life cycle of the species, Austral Pillwort is dependent on shallow swamps and waterways for reproduction. The proposed works will not impact upon any habitat as such, and therefore the life cycle of the species is unlikely to be impacted. Considering the above, it is unlikely that the removal of vegetation or any potential unknown individuals during the works would have an adverse effect on the life cycle of the species, to the point where it would put a viable population at risk of extinction.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Not applicable
In relation to the habitat of a threatened species or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**
The proposed works would involve the removal of up to approximately 0.52 ha of un-surveyed vegetation within Lots 18 and 16, which may serve as habitat for Austral Pillwort. However, the remaining areas to be impacted underwent thorough surveys, and no individual specimens of the species were recorded. It should also be noted that the area to be cleared is contiguous with a larger, well-preserved patch of vegetation surrounding the Nepean River riparian corridor. As the impacted areas in each lot are small and linear, it is unlikely that the removal would lead to further fragmentation or isolation of Austral Pillwort, even if unidentified individuals are affected. Furthermore, given that no locally occurring populations are known, the extent of habitat that would be affected is relatively small, and the resulting impact is not considered significant. Based on the absence of known records within a 10 km radius, and no known records were recorded during targeted surveys if the surrounding area, the impacts to potential habitat within Lots 18 and 16 are not considered important to the long-term survival of the species or ecological community in the locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed works would not impact on an area declared as of outstanding biodiversity value (either directly or indirectly).
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works have the potential to result in the following key threatening processes (KTPs) which are listed under the Schedule 4 of the BC Act, and which are considered relevant to Austral Pillwort: • Clearing of native vegetation. The proposed works would remove 0.52 ha of potential habitat for Austral Pillwort. However, the vegetation to be removed is adjacent to a larger, well-preserved patch of vegetation that surrounds riparian corridor of the Nepean River, so it its removal unlikely to exacerbate any of the listed key threatening processes. Additionally, measures have been suggested to control

Test of significance for Austral Pillwort
weed ingress in the study area during the proposed works, reducing the possibility of competition from the weeds currently present.
Conclusion.
In consideration of the above five factors, the proposed activity is not likely to significantly impact Austral Pillwort within the study area or wider locality, as: • The proposed works are unlikely to significantly alter the extent of the population to the point where it becomes locally extinct. • The removal of up to 0.52 ha of vegetation would not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long-term survival in the locality. • The localised nature of the proposed works would not significantly trigger or exacerbate any key threatening processes. Therefore, no further assessment is required and a SIS or BDAR is not required.

Matted Bush-pea *Pultenaea pedunculata*

Matted Bush-pea *Pultenaea pedunculata* is listed as an Endangered species under the BC Act. It is a is a shrub that forms carpets 1 m or more wide and 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. Flowers appear in spring (August to December), with fruit maturing from October to January but sometimes persistent on the plant until April-May (DPE 2022j).

This species is a climber to four metres high, with narrow leaves, twining stems and bell-shaped flowers. It has a scattered distribution within Prospect, Bankstown, Smithfield, Cabramatta Creek, St Mary's and north from Razorback Range.

Matted Bush-pea within the study area

Approximately 10 records of Matted Bush-pea occur within 15km of the study area. Targeted survey during the optimal survey period (September – November) was completed across the study area. However, two properties, Lot 16 in DP251051 and Lot 18 in DP251051 were not subject to targeted surveys for this species, due to access constraints. Vegetation within these lots comprises PCT 1395 and PCT 1181, which is associated with the species.

The total area of potential habitat to be impacted because of the proposed works, that was not subject to targeted surveys, is 0.52 hectares. Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether this removal is likely to lead to a significant impact to Matted Bush-pea, is provided below.

Test of significance for Matted Bush-pea
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Due to access constraints, approximately 0.52 ha of vegetation, which may provide potential habitat for Matted Bush-pea, was not subject to targeted surveys. Therefore, it is not possible to rule out the occurrence of the species within this vegetation, and that the removal will not result in impacts towards the species. Potential impacts to Matted Bush-pea resulting from the proposed works are predominantly in the form of total clearing to facilitate upgrades to Picton Road. This removal of native vegetation for the proposed works would reduce potential habitat for Matted Bush-pea in the study area, however, vegetation to be impacted is contiguous with a larger patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River. These areas will remain undisturbed post works and will continue to provide habitat for the species.

With respect to the life cycle of the species, the species is dependent on pollinators to reproduce. The proposed works will not substantially interfere with the abundance of pollinators, which will continue to thrive in areas of adjacent vegetation.

It is also important to mention that despite Lot 18 and Lot 16 not being specifically surveyed, the rest of the proposal site underwent comprehensive surveys, and no specimens of the species were detected. Overall, even in a worst-case scenario that unrecorded individuals are present in un-surveyed areas, the abundance of individuals would likely be limited to very few, and any impacts are unlikely to have a notable effect on the species' habitat. Consideration should also be made that whilst two lots (Lot 18 and 16) was not subject to targeted surveys, the remainder of areas to be impacted, were surveyed, and no individuals were recorded. Whilst these lots were not surveyed, effort was made to complete visual inspections from adjacent areas where possible. Both un-surveyed lots to be impacted exist as small, linear areas with similar condition habitat to other surveyed areas.

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

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

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

Not applicable

In relation to the habitat of a threatened species or ecological community:

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

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

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

The proposed works would involve the removal of up to approximately 0.52 ha of un-surveyed vegetation within Lots 18 and 16, which may serve as habitat for Matted Bush-pea. However, the remaining proposal site underwent thorough surveys, and no individual specimens of the species were recorded. It should also be noted that the area to be cleared is contiguous with a larger, well-preserved patch of vegetation surrounding the Nepean River riparian corridor. Considering this, impacts to the small and linear sections left un-surveyed are unlikely to lead to further fragmentation or isolation of Matted Bush-pea, even if unidentified individuals are affected. As discussed above, consideration should also be made that whilst two lots (Lot 18 and 16) were not subject to targeted surveys, the remainder of areas to be impacted were surveyed, and no individuals were recorded. Whilst these lots were not surveyed, effort was made to complete visual inspections from adjacent areas where possible. Both un-surveyed lots to be impacted exist as small, linear areas with similar condition habitat to other surveyed areas. Furthermore, given that no locally occurring populations are known, the extent of habitat that would be affected is relatively small, and the resulting impact is not considered significant.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposed works would not impact on an area declared as of outstanding biodiversity value (either directly or indirectly).

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposed works have the potential to result in the following key threatening processes (KTPs) which are listed under the Schedule 4 of the BC Act and which are considered relevant to Matted Bush-pea:

- Clearing of native vegetation.

The proposed works would remove 0.52 ha of habitat, which could serve as a potential habitat for Matted Bush-pea. However, the vegetation to be removed is adjacent to a larger, well-preserved patch of vegetation that surrounds riparian corridor of the Nepean River, so it is unlikely to exacerbate any of the listed key threatening processes. Additionally, measures have been suggested to control weed ingress in the study area during the proposed works, reducing the possibility of competition from the weeds currently present.

Conclusion.

In consideration of the above five factors, the proposed activity is not likely to significantly impact Matted Bush-pea within the study area or wider locality, as:

- The proposed works are unlikely to significantly alter the extent of the population to the point where it becomes locally extinct.
- The removal of up to 0.52 ha of vegetation would not result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long-term survival in the locality.
- The localised nature of the proposed works would not significantly trigger or exacerbate any key threatening processes.

Therefore, no further assessment is required and a SIS or BDAR is not required.

Sydney Plains Greenhood *Pterostylis saxicola*

Sydney Plains Greenhood *Pterostylis saxicola* is listed as an Endangered species under the BC Act. It is a deciduous ground orchid to 35 centimetres tall, with reddish brown and green translucent flowers, 5 – 8 rosette leaves and 2 – 4 closely sheathing stem leaves (Bishop n.d.). This species has very few known populations, of which are small and restricted to the western Sydney area between Picton and Freemans Reach. Flowering occurs from October to December but may vary with climate (DPE 2022k).

Sydney Plains Greenhood is found in a small range within NSW, occurring in sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.

Sydney Plains Greenhood within the study area

Only one old record of Sydney Plains Greenhood occurs within 10 km of the study area. Targeted survey during the optimal survey period (September – October) was completed across the study area. However, three properties, Lot 7 in DP 1280088, Lot 16 in DP251051 and Lot 18 in DP251051 were not subject to targeted surveys for this species, due to access constraints. Vegetation within these lots provides potential habitat for Sydney Plains Greenhood, and consists of PCT 849, PCT 1395 and PCT 1181.

Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether this removal is likely to lead to a significant impact to Sydney Plains Greenhood is provided below.

Test of significance for Sydney Plains Greenhood

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

Due to access constraints, targeted surveys could not be conducted during the optimal survey period for approximately 0.53 ha of vegetation. Therefore, it is not possible to rule out the occurrence of the species within this vegetation, and that the removal will not result in impacts towards the species. The proposed upgrade of Picton Road will require the complete clearing of vegetation within the proposal site, which will reduce potential habitat availability for the species in the immediate vicinity. Whilst these lots were not surveyed, effort was made to complete visual inspections from adjacent areas where possible. The area to be impacted exists as small, linear areas with similar condition habitat to other surveyed areas.

Only one record of the species occurs within 10 km of the study area, with the closest being approximately 3 km to the north. The absence of recorded specimens in the surveyed area, combined with the limited extent of un-surveyed vegetation, implies that the species is unlikely to occur within the study area.

The remaining proposal site underwent intensive targeted surveys, and no Sydney Plains Greenhood individuals were recorded. Furthermore, the area of potential habitat to be impacted is contiguous with a larger intact patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River. Within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present which provides equally suitable habitat to the vegetation being removed.

With respect to the life cycle of the species, all species of *Pterostylis* are deciduous and die back to fleshy, rounded underground tuberoids. The above ground parts of the plant wither and die following seed dispersal and the plant persists as a tuberoid until the next year. The species is also dependent on pollinators for reproduction. The proposed works will not substantially interfere with the abundance of pollinators, which will continue to thrive in areas of adjacent vegetation.

Based on the lack of recorded individuals within the remainder of the study area and locality, and the abundance of potential habitat within the surrounding areas, the proposed works are unlikely to have significant impacts on the species' habitat.

Considering these factors, it is unlikely that the removal of up to 0.53 ha of potential habitat, would have an adverse effect on the species' life cycle to the extent that it would threaten a viable population's survival. Therefore, the removal of vegetation within the proposal site is not expected to significantly impact the Sydney Plains Greenhood.

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

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

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

Not applicable.

In relation to the habitat of a threatened species or ecological community:

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

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

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

The proposed works would involve the removal of up to approximately 0.53 ha of un-surveyed vegetation that may contain habitat for the species. However, it is worth noting that the remaining proposal site underwent intensive targeted surveys, and no Sydney Plains Greenhood individuals were recorded. Furthermore, the area of potential habitat to be impacted is contiguous with a larger intact patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River. To elaborate, within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present. These areas provide equally suitable habitat to the vegetation being removed.

Based on these factors, the proposed impact to 0.53 ha of potential habitat for Sydney Plains Greenhood is unlikely to result in further fragmentation or isolation of the species, even if unidentified individuals are affected.

Based on the low abundance of known records within a 10 km radius (One only), and no known records were recorded during targeted surveys in the surrounding area, the impacts to potential habitat are not considered important to the long-term survival of the species in the locality.

Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposed works would not impact on an area declared as of outstanding biodiversity value (either directly or indirectly).

Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposed works have the potential to result in the following key threatening processes (KTPs) which are listed under the Schedule 4 of the BC Act, and which are considered relevant to Sydney Plains Greenhood:

- Clearing of native vegetation.
- Competition from increasing weed densities and further invasion.

The proposed works would involve clearing about 0.53 ha of potential habitat for Sydney Plains Greenhood. However, considering the linear nature of impacts, no known populations occur within 10km, and that vegetation to be removed is adjacent to a larger, well-preserved patch of vegetation that surrounds riparian corridor of the Nepean River, it is unlikely to exacerbate any of the listed key threatening processes. Additionally, measures have been suggested to control weed ingress in the study area during the proposed works, reducing the possibility of competition from the weeds currently present.

Conclusion.

In consideration of the above five factors, the proposed activity is not likely to significantly impact Sydney Plains Greenhood within the study area or wider locality, as:

- There are no records of the species within a 10 km radius, and intensive surveys across the remainder of the study area did not record the species.
- The proposed works are unlikely to significantly alter the extent of the population to the point where it becomes locally extinct.
- Impacts from removal is unlikely to result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long-term survival in the locality.
- The localised nature of the proposed works would not significantly trigger or exacerbate any key threatening processes.

Therefore, no further assessment is required and a SIS or BDAR is not required.

Thick Lip Spider Orchid *Caladenia tessellata*

The Thick Lip Spider Orchid is listed as Endangered under the BC Act. This species belongs to a group of orchids that have five long, spreading petals and sepals surrounding a broad down-curled labellum, or "lip". It is characterized by cream-colored petals with reddish stripes and a yellowish labellum with a few darker stripes. The orchid has a long, sparsely-hairy, narrow leaf that regrows each year, growing up to 6 cm long and 5 mm wide. The column base of the orchid has two prominent yellow glands.

The Thick Lip Spider Orchid is known to occur in the Sydney area, as well as in Wyong, Ulladulla, and Braidwood in New South Wales. However, populations in Kiama and Queanbeyan are presumed to be extinct. The species has also been recorded in the Huskisson area in the 1930s. The orchid is found along the coast in Victoria from east of Melbourne to almost the New South Wales border. It is generally found in grassy sclerophyll woodland on clay loam or sandy soils.

The Thick Lip Spider Orchid flowers from September to November, with flowers generally appearing late September or early October in extant southern populations.

Thick Lip Spider Orchid within the study area

Whilst Thick Lip Spider Orchid is a BAM candidate species, no records of this species occur within 10 kilometres from the study area, with the closet being approximately 40 kilometres north-west. Targeted survey during the optimal survey period (September – October) was completed across the study area. However, three properties, Lot 7 in DP 1280088, Lot 16 in DP251051 and Lot 18 in DP251051, were not subject to targeted surveys for this species, due to access constraints. Vegetation within these lots provides potential habitat for Thick Lip Spider Orchid and comprises PCT 849, PCT 1395 and PCT 1181.

Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether this removal is likely to lead to a significant impact to Thick Lip Spider Orchid is provided below.

Test of significance for Thick Lip Spider Orchid
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Due to access constraints, targeted surveys could not be conducted during the optimal survey period for approximately 0.53 ha of vegetation. Therefore, it is not possible to rule out the occurrence of the species within this vegetation, and that the removal will not result in impacts towards the species. The proposed upgrade of Picton Road will require the complete clearing of vegetation within the proposal site, which will reduce potential habitat availability for the species in the immediate vicinity. Whilst these lots were not surveyed, effort was made to complete visual inspections from adjacent areas where possible. The area to be impacted exists as small, linear areas with similar condition habitat to other surveyed areas. The proposed works will involve the complete clearing of vegetation within the proposal site to facilitate upgrades to Picton Road which will reduce the availability of potential habitat for the species within the immediate areas to be affected. The remaining proposal site underwent intensive targeted surveys, and no Thick Lipped Spider Orchid individuals were recorded. Furthermore, the area of potential habitat to be impacted is contiguous with a larger intact patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River, which provides equally suitable habitat to the vegetation being removed. To elaborate, within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present. These areas provide equally suitable habitat to the vegetation being removed. No records of the species occur within 10 km of the study area, with the closest being approximately 39 km to the northeast in the surrounds of Sydney. The absence of recorded specimens in the surveyed area, combined with the limited extent of un-surveyed vegetation, implies that the species is unlikely to occur within the study area. With respect to the life cycle of the species, the species is dependent on pollinators to reproduce. However, given that the species likely relies on only a single species of pollinator, it is highly vulnerable to changes in pollinator abundance or shifts in the time of year that the pollinator. Nonetheless, The proposed works will not substantially interfere with the abundance of pollinators, which will continue to thrive in areas of adjacent vegetation Based on the lack of recorded individuals within the remainder of the study area, and the abundance of potential habitat within the surrounding areas, the proposed works are unlikely to have significant impacts on the species' habitat. Considering these factors, it is unlikely that the removal of up to 0.53 ha of potential habitat, would have an adverse effect on the species' life cycle to the extent that it would threaten a viable population's survival. Therefore, the removal of vegetation within the proposal site is not expected to significantly impact the Thick Lipped Spider Orchid.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Not applicable.
In relation to the habitat of a threatened species or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**

Test of significance for Thick Lip Spider Orchid
The proposed works would involve the removal of up to approximately 0.53 ha of un-surveyed vegetation which may provide habitat for the species. However, it is worth noting that the remaining proposal site underwent intensive targeted surveys, and no Thick Lip Spider Orchid individuals were recorded. Furthermore, the area of potential habitat to be impacted is contiguous with a larger intact patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River, which provides equally suitable habitat to the vegetation being removed. Within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present. These areas provide equally suitable habitat to the vegetation being removed. Based on these factors, the proposed impact to 0.53 ha of potential habitat for Thick Lipped Spider Orchid is unlikely to result in further fragmentation or isolation of the species, even if unidentified individuals are affected. Considering the species was not recorded during targeted surveys in the surrounding area, in similar habitat, and the abundance of suitable habitat within the locality, the impacts to 0.53 ha of potential habitat are not considered important to the long-term survival of the species in the locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed works would not impact on an area declared as of outstanding biodiversity value (either directly or indirectly).
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works have the potential to result in the following key threatening processes (KTPs) which are listed under the Schedule 4 of the BC Act and which are considered relevant to Thick Lip Spider Orchid: • Clearing of native vegetation. • Competition from increasing weed densities and further invasion. The proposed works would involve clearing about 0.53 ha of potential habitat for Thick Lipped Spider Orchid. However, considering the linear nature of impacts, no known populations occur within 10 km, and that vegetation to be removed is adjacent to a larger, well-preserved patch of vegetation that surrounds riparian corridor of the Nepean River, it is unlikely to exacerbate any of the listed key threatening processes. Additionally, measures have been suggested to control weed ingress in the study area during the proposed works, reducing the possibility of competition from the weeds currently present.
Conclusion.
In consideration of the above five factors, the proposed activity is not likely to significantly impact Thick Lip Spider Orchid within the study area or wider locality, as: • There are no records of the species within a 10 km radius, and intensive surveys across the remainder for the study area did not record the species. • The proposed works are unlikely to significantly alter the extent of the population to the point where it becomes locally extinct. • Impacts from removal is unlikely to result in the isolation or fragmentation of locally occurring habitat within the study area and as such is unlikely to affect its long-term survival in the locality. • The localised nature of the proposed works would not significantly trigger or exacerbate any key threatening processes. Therefore, no further assessment is required and a SIS or BDAR is not required.

Threatened fauna

Little Lorikeet *Glossopsitta pusilla*

The Little Lorikeet *Glossopsitta pusilla*, listed as Vulnerable under the BC Act, is a widely distributed species, occurring across the coastal and Great Divide regions of eastern Australia, from Cape York down to South Australia. The state of NSW contains a large portion of the species' core habitat, with Little Lorikeets found westward as far as Dubbo and Albury. Nomadic movements are commonly influenced by season and food availability, although some individuals do remain in one place for much of the year (DPE 2023c).

Roosting occurs in treetops, which are often distant from feeding areas. Nesting primarily occurs within close proximity to feeding areas, with most breeding pairs selecting hollows in the limb or trunk of smooth-barked Eucalypts. The entrances of these hollows are usually small (around 3 centimetres) and high above the ground (two to 15 metres). Nesting sites are often used repeatedly for decades, suggesting that preferred sites are limited. Riparian trees are often chosen, including Allocasuarina species. Nesting season extends from May to September and, in years when flowering is prolific, Little Lorikeet pairs can breed twice, producing 3-4 offspring per attempt (DPE 2023c).

Little Lorikeet primarily forages in the canopy of Eucalyptus species. in open forests and woodlands, however will also feed on other species including Angophora and Melaleuca species, other species, are also utilised although they primarily use those of the Myrtaceae family. They mainly feed on nectar, pollen, and occasionally on native fruits such as mistletoe. Riparian habitats are particularly used as well as isolated flowering trees in open country. Roadside remnant and urban trees also help sustain viable populations of the species (DPE 2023c).

Little Lorikeet within the study area

Little Lorikeet was directly observed flying over the study area during the field investigations. Previous records of the Little Lorikeet also exist in the surrounding locality (61 records within 10 kilometres of the study area), with the most recent records collected in 2021 and the closest records located within 788 metres of the study area. The study area is not mapped as important habitat for the Little Lorikeet in the BAM – Important Areas viewer (DPE 2023d).

The proposed works would result in the removal of up to 8.40 hectares of native vegetation providing potential foraging habitat and 13 hollow-bearing trees, containing 10 small hollows (<50 millimetres) providing potential nesting resources for the species. Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether the proposed works are likely to lead to a significant impact to habitat for Little Lorikeet, based on the criteria detailed under Section 7.3 of the BC Act, is provided below.

Test of Significance for Little Lorikeet
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
The proposed works would involve removal of up to 8.40 ha of native vegetation, and 13 hollow-bearing trees which may provide potential foraging and breeding habitat for the Little Lorikeet within the study area. The habitat within the broader study area includes PCT 849 Cumberland shale plains woodland, PCT 1181 Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion and PCT 1395 Cumberland shale - sandstone Ironbark forest, which may provide foraging resources in the form of flowering Eucalyptus, Angophora and Melaleuca species. The proposal site also contains 13 hollow-bearing trees (13 small hollows with an entrance of less than 50 mm), which may provide potential nesting resources. The vegetation to be removed would be primarily confined to areas of previous disturbance within the strip of vegetation running parallel to the road verges of Picton Road and the M31 Hume Motorway. Areas of moderate quality foraging habitat primarily occur within the western and southern most sections of the study area, as part of the riparian corridor along the Nepean River. Scattered paddock trees throughout the study area may also provide some marginal habitat for this species, as these areas are disturbed due to historic clearing, their proximity to Picton Road/the M31 Hume Motorway and ongoing land management (agriculture and grazing). Breeding habitat within the study area is currently subject to disturbance from Picton Road and the motorway with noise, vibration and light pollution all being relatively high. The potential nesting sites afforded by the hollow-bearing trees within the study area are considered to provide low quality habitat because of these features being often exposed such disturbances. While much of the landscape has been historically cleared for agricultural purposes, connectivity to surrounding vegetation remains relatively high for this highly mobile species, particularly along Byrnes Creek, the Nepean River and within the Upper

Test of Significance for Little Lorikeet
Nepean State Conservation Area. As such, the >1,000 ha of connective vegetation within the broader locality is likely to provide significant foraging and breeding resources for the Little Lorikeet. In the context of the broader locality, the removal of a relatively small (8.40 ha) linear section of vegetation providing low quality foraging and breeding habitat, is not expected to significantly reduce the resources for this species, such that it would adversely affect the life cycle of the species, to the extent that a local viable population would be placed at risk of extinction. Standard mitigation measures as detailed in Biodiversity Guidelines: Protecting and managing biodiversity on RTA proposals (RTA 2011a) would be in place to ensure no interruption of breeding or direct impact to individuals is likely.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Entity is not an ecological community, does not apply.
In relation to the habitat of a threatened species or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**
The proposed works will result in the removal of up to 8.40 ha of potential foraging, roosting and nesting habitat for Little Lorikeet across three PCTs (PCT 849, PCT 1181 and PCT 1395). The works will also require the removal of up to 13 small hollows (< 50 millimetres) which may provide breeding habitat for the species. Remnant vegetation representing potential habitat, primarily occurs in the western and southern most sections of the study area, adjacent to the Nepean River. The proposal site in these areas has been reduced during the design process, resulting in avoidance of larger scale impacts in these habitat areas. Given the linear nature of the proposal and the highly mobile nature of the species, vegetation to be removed is unlikely to result in further fragmentation or isolation of habitat. In addition, impacts are confined to a narrow corridor of pre-disturbed vegetation immediately adjacent to Picton Road and the M31 Hume Motorway road verges. While the widening of these roads will increase the distance between patches of remnant vegetation, given the highly mobile nature of the Little Lorikeet, these widening works do not represent a significant barrier to movement for the species. The removal 8.40 ha of moderate and low-quality habitat along the road verge of Picton Road and the M31 Hume Motorway is unlikely to significantly reduce the availability of foraging and breeding resources within the broader locality. Removal of native vegetation within the study area equates to <2 %, of vegetation within the broader locality (as represented by the connected riparian corridors of Byrnes Creek and the Nepean River, and the Upper Nepean Conservation Area). As such, potential habitat to be removed represents a small proportion of habitat which may be utilised by a local population of this highly mobile species. The development would not increase fragmentation or isolation of any areas of habitat for this highly mobile species and is not likely to result in the local population becoming genetically isolated. Furthermore, given the degraded nature of the roadside habitat to be impacted, these habitat features likely provide marginal breeding resources only for this species.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed works will not take place within, or in proximity to a declared area of outstanding biodiversity value.

Test of Significance for Little Lorikeet
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
• Key threatening processes (KTPs) of relevance to Little Lorikeet as listed under Part 2 of the BC Act include: • Clearing of native vegetation. • Loss of hollow-bearing trees. • High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition. • Aggressive exclusion of birds from woodland and forest habitat by over abundant Noisy Miners *Manorina melanocephala* • Predation by feral or domestic cats and foxes. The main threat to Little Lorikeet in NSW is clearing or modification of native vegetation (DPE 2023c), which the proposed works will moderately contribute to via impacts to 8.40 ha of foraging habitat in the form of PCT 849and PCT 1395. While the works will result in the clearing of native vegetation, overall vegetation to be removed represents < 2.5 % of vegetation within the broader locality (as represented by connected riparian corridors and the Upper Nepean Conservation Area). The proposed works are not expected to significantly change the long-term management of vegetation within the study area in a manner considered likely to result in the alteration to fire regimes or the occurrence of Noisy Miners. Although the cumulative impacts of vegetation clearing and hollow loss across the study area would contribute to an increase in the impact of the above listed KTPs, the scale of impacts are considered unlikely to contribute significantly to the KTPs listed above.
Conclusion.
It is concluded that the proposed works will not significantly impact Little Lorikeet, as: • Habitat removal within the study area will be limited to road verges already subject to edge effects and ongoing disturbances, associated with Picton Road or the M31 Hume Motorway. Habitat to be removed represents a relatively small area of foraging habitat and low-quality potential breeding habitat, in the context of the broader locality. • Removal of vegetation is not considered likely to cause an adverse impact on the life cycle of the species such that the local population (or species as a whole) is likely to be placed at risk of extinction. • The vegetation to be removed would not fragment or isolate remaining areas of habitat for the local population of Little Lorikeet. • Habitat to be impacted comprises of low-quality breeding habitat containing up to 13 small hollows potentially suitable for nesting and a 8.40 ha of foraging habitat and is not considered to be important to the survival of the local population or the species as a whole. • The proposed works would contribute on a small scale to the Key Threatening Processes identified for the species through the clearing of 8.40 ha of native vegetation and the removal of 13 small hollows. However, these impacts are unlikely to significantly contribute to any KTP. • Standard mitigation measures as detailed in *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a) would be in place to ensure no interruption of breeding or direct impact to individuals is likely. Therefore, further assessment in the form of a BDAR or a SIS is not required.

Hollow-dependent microbat species

Four tree-roosting insectivorous bat species listed as Vulnerable under the BC Act were identified as having a medium or higher likelihood of occurring within the study area based on previous records and acoustic recordings. These species identified are:

- Eastern False Pipistrelle *Falsistrellus tasmaniensis* (Vulnerable, BC Act).
- Greater Broad-nosed Bat *Scoteanax rueppellii* (Vulnerable, BC Act).
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris* (Vulnerable, BC Act).

Ecological descriptions for each of these identified species and their occurrence within the study area have been provided below.

Eastern False Pipistrelle

Eastern False Pipistrelle is a relatively large species of microbat with dark brown to reddish fur on its back, a paler grey belly and a body length of about 65 millimetres. The species is found on the south-east coast and ranges of Australia, extending from Southern Queensland down to Victoria and Tasmania, including coastal areas of NSW (DPE 2022l).

The species generally prefers moist habitats, with trees taller than 20 metres. It typically roosts in hollows within Eucalyptus trees in colonies of three to 80 individuals, but has also been found under loose bark on trees or in buildings. They are an insectivorous species, feeding primarily on larger prey items including beetles and moths and occasionally bugs, ants and flies. They typically hunt within or just the below the tree canopy, favouring gaps and spaces within the forest (Churchill 2008).

Greater Broad-nosed Bat

Greater Broad-nosed Bat is a large, powerful species of microbat that grows up to 95 millimetres long. It has a broad head a short square muzzle and is coloured dark reddish-brown above and slightly paler below. Its larger size is used to distinguish it from other broad-nosed bats. The species occurs in gullies and river system that drain the Great Dividing Range and ranges from north-eastern Victoria up to the Gold Coast in Queensland.

The species utilises a variety of habitats Including woodland, moist and dry Eucalyptus forests and rainforest; however it is most commonly found in tall wet forests. It generally roosts in tree hollows however it is also known to utilised man-made structures. The species forages after sunset along creek and river corridors in search of beetles and other large, slow-flying insects (DPE 2023e).

Yellow-bellied Sheathtail-bat

Yellow-bellied Sheathtail-bat is a large insectivorous bat with a flattened head and pointed muzzle with a white to yellow belly and is wide-ranging occurring from northern and eastern Australia, occasionally visiting south-western NSW and Victoria in late summer and autumn. Yellow-bellied Sheathtail-bat roosts singly or in groups of up to six in tree hollows and buildings, and occasionally mammal burrows in treeless areas (DPE 2023f).

Microbat species within the study area

Combined results of acoustic surveys undertaken by both NGH and Biosis included detection of calls with features characteristic of the Eastern False Pipistrelle, Greater Broad-nosed Bat and the Yellow-bellied Sheathtail-bat within the study area. Vegetation to be removed within the proposal site comprises 8.40 hectares containing up to 13 hollow-bearing trees requiring removal as part of the proposed works. Microbats within the locality are also likely to forage within remnant vegetation along Picton Road and the M31 Hume Motorway. Impacts each of the above species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether the proposed works are likely to lead to a significant impact for these species, based on the criteria detailed under Section 7.3 of the BC Act, is provided below.

Test of Significance for hollow-dependent microbat species
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Test of Significance for hollow-dependent microbat species
Impacts likely to have an adverse effect on the life cycle of the four listed bats include direct mortality, loss of high productivity foraging habitat and loss of roosting habitat. The proposed works would result in removal of up to 8.40 ha of vegetation providing potential foraging habitat for the four species and the removal of up to 13 hollow-bearing trees (containing 13 small, 11 medium and 7 large sized hollows) providing potential roosting habitat. Within the wider locality areas of remnant vegetation along of Byrnes Creek, the Nepean River and within the Upper Nepean State Conservation Area, would likely provide similar habitat containing similar resources. Vegetation to be removed occurs along the road verge of Picton Road and the M31 Hume Motorway, and as such, represents low quality foraging and roosting habitat due to noise, light and vibration pollution from these roadways. Removal of hollow-bearing trees may reduce the overall carrying capacity of the study area for the species, however the relatively small scale of removal of edge effected vegetation across the length of the alignment and removal of up to 13 hollow-bearing trees is unlikely to significantly reduce the availability of resources for these highly mobile species, such that an adverse effect on the life cycle of the species would occur to the extent they are likely to be placed at risk of extinction. Standard mitigation measures as detailed *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a) would be in place to ensure no interruption of breeding or direct impact to individuals is likely.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Not applicable, not an ecological community.
In relation to the habitat of a threatened species or ecological community: **the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**
The proposed works would result in the removal of up to 8.40 ha of native vegetation, including the removal of 14 hollow-bearing trees that represents potential roosting habitat for the microbat species. The vegetation to be removed would be confined to areas of previous disturbance within the strip of vegetation running parallel to the road verge of Picton Road and the M31 Hume Motorway. Given the highly mobile nature of the four microbat species, which are capable of foraging over large distances, and the location of the study area being adjacent to remnant suitable habitat, the removal of this vegetation is unlikely to result in further fragmentation or isolation of habitat for the species. The hollow-bearing trees within the study area likely represent a very small fraction of the available habitat for this species, which are known to inhabit multiple hollows within their home range (DPE 2022m). Retained vegetation in the broader locality along the riparian corridors and within the Upper Nepean State Conservation Area, would continue to provide similar habitat and can be reasonably expected to support similar features. Whilst some species may utilise hollow-bearing trees for roosting during breeding, it is unlikely that the removal of the relatively small number of hollows within the study area would reduce the availability of resources in the locality to the point that the long-term survival of these species would be significantly impacted.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

Test of Significance for hollow-dependent microbat species
The proposed works will not take place within, or in proximity to a declared area of outstanding biodiversity value.
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works have the potential to result in the following KTPs which are listed under the Schedule 4 of the BC Act and which are considered relevant to the Eastern False Pipistrelle, Greater Broad-nosed Bat and Yellow-bellied Sheath-tail Bat • Clearing of native vegetation. • Loss of hollow-bearing trees. Approximately 8.40 ha of native vegetation, including 13 hollow-bearing trees, would be impacted by the proposed works. Although the cumulative impacts of vegetation clearing and hollow loss across the region over time would contribute to an increase in the impact of the above listed KTPs, the relatively small scale of impacts (<2.5 % of remanent vegetation within the broader locality) is considered unlikely to contribute significantly to the KTPs listed above.
Conclusion.
In consideration of the above five factors, the proposed works is not likely to significantly impact the four microbat species within the study area or wider locality, as: • The proposed works would remove approximately 8.40 ha of native vegetation that provides marginal foraging habitat for the microbat species. • Works are limited to removal of 13 hollow-bearing trees, adjacent to existing infrastructure (Picton Road and the M31 Hume Motorway) and therefore subjected to noise, light and vibration disturbance impacts. • In the context of available resources within the broader locality, the removal of a relatively small edge effected patch of vegetation is unlikely to significantly increase any KTP. • The habitat to be removed is not considered important to the long-term survival of the species. • Standard mitigation measures as detailed *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a) would be in place to ensure no interruption of breeding or direct impact to individuals is likely. Therefore, no further assessment is required and a SIS or BDAR is not required.

Southern Myotis *Myotis macropus*

The Southern Myotis, listed as Vulnerable under the BC Act, has a wide distribution within the coastal band (i.e. less than 100 kilometres inland) of Australia, occurring from north-west Australia, across the top-end and south to western Victoria (DPE 2022n). The species generally roosts in groups of 10 to 15 individuals, preferably close to water in a number of different habitat structures including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, bridges and in dense foliage. Southern Myotis forages over open water, generally across pools and channels greater than three metres wide, using its large feet to collect insects and small vertebrates from the water surface (DPE 2022n, Law & Urquhart 2000, Campbell 2009).

Southern Myotis within the study area

The Southern Myotis was recorded during targeted surveys conducted by both Biosis and NGH. Targeted surveys included inspection of the Pheasants Nest Bridge during winter (August 2022), which included a visual inspection of accessible sections under the bridge, and dusk surveys to observe bats exiting potential roost habitat. Dusk surveys also included acoustic recordings taken to assist in determining species of microbats. Observations during the survey combined with acoustic

recordings (linear calls, bats without physical characteristics of *Nyctophilus* species), indicated that bats observed to be roosting within scupper holes of the bridge were likely to be Southern Myotis individuals.

In addition to the habitat afforded by Pheasants Nest Bridge, farm dams within the study area and proposal site provide suitable foraging habitat for the species, with smaller waterways providing limited foraging opportunity due to the ephemeral nature, narrow width and lack of pools/stretches at least three metres wide. Hollow-bearing trees occurring in proximity to these water features represent potential roosting habitat for the species. The Nepean River to the south and west of the proposal site is also likely to provide suitable foraging habitat and potential roosting within overhangs and caves provided by the sandstone outcropping of the Nepean River Gorge. Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether the proposed works are likely to lead to a significant impact to habitat for Southern Myotis, based on the criteria detailed under Section 7.3 of the BC Act, is provided below.

Test of Significance for Southern Myotis
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
Impacts likely to have an adverse effect on the life cycle of the Southern Myotis include direct mortality, loss of high productivity foraging habitat, loss of roosting habitat, introduction of exotic pathogens and wildfire fires during the breeding season. Southern Myotis are highly mobile and the local population is not considered to be isolated or disjunct from other areas. A total of 7.84 ha of vegetation providing potential habitat would be removed, including 13 hollow-bearing trees containing 13 small, 11 medium and 7 large sized hollows, which provide potential roosting habitat for this species. The proposed works would also have an impact on Pheasants Nest Bridge, over the Nepean River, which provides roosting habitat, and farm dams that provide foraging habitat for this species. While the species was determined as likely to be roosting within Pheasants Nest Bridge, no direct impacts are expected to occur to this bridge such that roosting habitat would be disturbed. Further, roosting bats were only detected during winter survey (August) and it is considered unlikely the habitat within the bridge, at least on the side of the Nepean on which the works will occur, is providing breeding habitat. While some indirect impact (noise, light, vibration and clearing of surrounding vegetation) may occur, mitigation measures will be implemented were possible to minimise indirect impacts. Removal of hollow-bearing trees and temporary disturbance of the bridge structure may reduce the carrying capacity of the study area for the species. The removal of up to 7.84 ha of vegetation and temporary indirect impacts to man-made structures is considered unlikely to reduce the area of occupancy of the local population or disrupt important life cycle events (maternity roost habitat) such that the proposal would have an adverse effect on the life cycle of the species. While potential impacts may disrupt individuals of the species, impacts are not expected at a scale such that a viable local population of the species is likely to be placed at risk of extinction. In addition, recommendations included for the proposed works will minimise the potential for individual mortality. All mitigation measures will be undertaken in accordance with *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a).
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Not applicable, not an ecological community.
In relation to the habitat of a threatened species or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**

Test of Significance for Southern Myotis
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**
The proposed works would result in the removal of up to 7.84 ha of native vegetation, including the removal of up to 13 hollow-bearing trees throughout the alignment that represents potential roosting habitat for Southern Myotis. The proposed works would also have indirect impacts to Pheasants Nest Bridge. In addition to these indirect impacts, directs impacts are expected to occur to a several smaller bridges and culvert earmarked for replacement that provide roosting habitat. The 10 waterways and multiple dams within the study area provide foraging habitat for this species. Southern Myotis are highly mobile and are capable of foraging over large distances. High quality habitat occurs to the south and west associated with the Nepean River and gorge, the Upper Nepean Conservation Area to the south-east and with Cordeaux Dam, Lake Cataract and the Illawarra Escarpment to the east. The proposed works would not significantly reduce the available area of foraging and roosting habitat and would not result in the construction of any barrier likely to impact dispersal of the species. Vegetation to be removed would be confined to relatively small, linear section of vegetation subject to existing disturbance along the road verge of Picton Road and the M31 Hume Motorway. Given the location of the study area directly beside cleared agricultural land and the highly mobile nature of the species, removal of this vegetation would not result in further fragmentation or isolation of habitat for the species. The area of habitat proposed for removal represents a small proportion of the available habitat for the species within 10 kilometres of the study area. Some marginal foraging habitat may be impacted by the proposed works, however mitigation measures including erosion and sediment controls would prevent indirect impacts to waterways. Habitat adjoining the study area and surrounding riparian corridors is of similar structure, age and composition as vegetation within the proposal site. The hollow-bearing trees within the study area likely represents a small fraction of the available habitat for this species in the locality. The culverts and bridges within the study area may provide roosting and breeding habitat. Removal of these features may substantially impact on individuals utilising the study area for breeding resources through direct mortality and reduction of the availability of suitable breeding habitat in the locality. However, given the species' highly mobile nature and the availability of habitat in adjacent areas of retained vegetation (Nepean River, Byrnes Creek and Upper Nepean Conservation area), it is unlikely that impacts would be significant to the species long-term survival in the locality. Furthermore, no direct impacts are expected to occur to roosting habitat identified within Pheasants Nest Bridge. Therefore, impacts resulting from the proposed habitat removal are not considered significant, and it is therefore unlikely that the proposal would have a significant impact on the long-term survival of the species within the locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed works will not take place within, or in proximity to a declared area of outstanding biodiversity value.
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
The proposed works have the potential to result in the following KTPs which are listed under the Schedule 4 of the BC Act and which are considered relevant to the Southern Myotis: • Clearing of native vegetation • Loss of hollow-bearing trees Approximately 7.84 ha of native vegetation, including 13 hollow-bearing trees, would be impacted by the proposed works. Although the cumulative impacts of vegetation clearing and hollow loss across the region over time would contribute to an increase in the impact of the above listed KTPs, the relatively small scale of impacts (<2.5 %) of remanent vegetation within the broader locality) is considered unlikely to contribute significantly to the KTPs listed above.

Test of Significance for Southern Myotis
Conclusion.
In consideration of the above five factors, the proposed works is not likely to significantly impact Southern Myotis within the study area or wider locality, as: • The proposed works would remove approximately 7.84 ha of native vegetation that provides marginal foraging habitat for Southern Myotis. • Works are limited to removal of up to 13 hollow-bearing trees, adjacent to existing infrastructure associated with Picton Road and the M31 Hume Motorway and therefore subject to noise, light and vibration disturbance impacts. • No direct impacts are expected to occur to the known roosting location at Pheasants Nest Bridge. Mitigation measures will be implemented to minimise indirect impacts to roosting habitat. • Replacement of bridges and culverts is unlikely to reduce the availability of resources in the locality such that the species is placed at risk of extinction. • The localised nature of the proposed works would not significantly trigger or exacerbate any KTPs. • The habitat to be removed is not considered important to the long-term survival of the species as a whole. • Standard mitigation measures as detailed *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011a) would be in place to ensure no interruption of breeding or direct impact to individuals is likely. Therefore, no further assessment is required and a SIS or BDAR is not required. In addition, preclearance surveys for Southern Myotis are to be undertaken prior to removal of vegetation to ensure any individuals are translocated and not directly impacted by the proposed works. If the species is found to be utilising roosting habitat in bridges and culverts other than Pheasants Nest Bridge, mitigation measures are provided which include the installation of supplementary habitat adjacent to the study area, prior to the commencement of work on these features, in order to reduce the level of impact to the species.

Koala Phascolarctos cinereus

Koala populations in Queensland, NSW and ACT are listed as endangered under the NSW BC Act. Koalas occupy a range of eucalypt-dominated forest and woodland types throughout their range, but favour habitats that support key forage species in more mesic microhabitats. Altitude (< 800 metres above sea level) and temperature restrict the Koalas distribution, as does leaf moisture at the western and northern ends of the range.

Key threats to Koala include habitat fragmentation, predation by dogs, vehicle strikes and disease. Climate change may also be affecting Koala populations through increased temperatures causing heat stress and a reduction in the level of moisture within the leaves of browse trees.

Previous records of Koalas exist within both the study area (two records to the south-west of the study area and several records surrounding the Nepean River) and within the in the surrounding locality (1167 records within 10 kilometres of the study area). Koala was recorded from the presence of scats located in vegetation adjacent to the study area during habitat assessments conducted in August 2022. The southern extent of the study area is mapped as priority conservation land and Koala habitat under the Cumberland Plain Conservation Plan (CPCP) (DPE 2022a) and provides a connective corridor throughout the landscape, along the Nepean River.

Koalas are likely to utilise the study area. Impacts to this species under the BC Act have excluded any impacts to potential habitat within 'Certified Urban Capable Land' under the CPCP. An assessment of whether the proposed works are likely to lead to a significant impact to habitat for Koalas, based on the criteria detailed under Section 7.3 of the BC Act, is provided below.

Test of Significance for Koala
In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.
The Koala occurs in NSW from the border with Queensland through to the border with Victoria. For the purpose of this assessment the local population of koalas are assumed to include all koala which occur within the southern Sydney Koala Population (Campbelltown and Wollondilly LGAs) as identified in the CPCP Sub-plan B: Koalas (DPE 2022i). Importantly the southern Sydney Koala Population would also be considered to constitute an important population, as the area is known to have a high level of occupancy for the koala (DSEWPC 2012). The vegetation within the study area associated with the Nepean River is mapped under the Cumberland Plain Conservation Plan (DPE 2022a) as a Koala habitat corridor and priority conservation land. The proposed works will result in the removal of up to 7.52 ha of habitat, comprised of a linear strip of vegetation along the northern and southern edge of Picton Road and to the east and west of the M31 Hume Motorway. The vegetation to be removed is well connected to larger patches of remnant vegetation within protected lands including the Bargo State Conservation Area and Nattai National Park to the south-east, which are in turn connected through to the Blue Mountains National Park. The study area is also well connected towards the east to the Upper Nepean State Conservation Area and vegetation associated with the Illawarra Escarpment including through to Heathcote National Park in the north-east. Although Picton Road and the M31 Hume Motorway provide a fatality risk for dispersing Koala, connectivity to large patches of high-quality remnant vegetation throughout the study area is relatively high, particularly through areas which occur near the Nepean River. Removal of vegetation along a linear strip adjoining the existing busy M31 Hume Motorway and Picton Road will not reduce connectivity through the broader landscape, and is unlikely to significantly reduce the area of occupancy of the species within the locality due to the availability of resources within vegetation retained both within the study area and along the Nepean River corridor. Further, much of this vegetation is protected under the CPCP priority conservation land mapping, retaining connectivity along the Nepean River. The removal of up to 7.52 ha of vegetation along a linear corridor within a larger patch of native vegetation providing habitat for Koala is considered unlikely to lead to an adverse impact on the life cycle of the species such that a viable local population is likely to be placed at risk of extinction, as it will not limit Koala movement throughout the broader locality, nor will it significantly reduce the availability of foraging resources within the locality. As such, the proposed works are unlikely to adversely affect the lifecycle of the local Koala population such that it would be placed at risk of extinction.
In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity: **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or** **(ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**
Entity is not an ecological community, does not apply.
In relation to the habitat of a threatened species or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and** **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**

Test of Significance for Koala
The proposal will impact upon up to 7.52 ha of foraging and dispersal habitat in the form of PCT 1395, 1185 and 849, which include Koala feed tree such as, Grey Gum, Broad-leaved Ironbark and Narrow-leaved Ironbark. Vegetation to be removed occurs along a linear corridor either side of Picton Road and the M31 Hume Motorway. Connective corridors along the Nepean River provide a significant pathway for movement of the Koala population through vegetation to the north of Picton Road and to the south of the M31 Hume Motorway. Removal of a linear strip of vegetation adjacent to the existing road is unlikely to impede movement of the species such that this corridor would be reduced in its efficacy. In addition, works along Picton Road and the M31 Hume Motorway are underway to install Koala fencing to prevent mortality from individuals attempting to cross these high-speed roads. These fences will funnel Koala towards the Nepean River where they are able to safely cross Picton Road and the M31 Hume Motorway by passing under existing bridges. Therefore, it is not considered likely that the habitat will become fragmented or isolated from other areas of habitat because of the proposed works. The habitat to be removed consists of a linear strip adjacent to either side of the M31 Hume Motorway and Picton Road. Within the broader locality, habitat adjoining the study area is comprised of large patches of in-tact native vegetation consisting of the same PCTs and similar habitat features which will not be impacted by the proposed works. While the vegetation forms part of a connective corridor through the broader region, given the location (adjoining existing roadways) and scale of removal, this vegetation is considered unlikely to form important habitat for Koala in the context of the broader locality.
Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).
The proposed works will not take place within, or in proximity to a declared area of outstanding biodiversity value. The proposed works will occur on land delineated under the CPCP as Koala habitat and priority conservation land. The removal of the narrow linear strip of vegetation is not considered likely to impact on the overall available habitat for the species in the locality.
Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.
Key threatening processes (KTPs) of relevance to Koala as listed under Part 2 of the BC Act include: • Clearing of native vegetation. • Invasion of weeds (including Lantana, African Olive, exotic vines, scramblers and perennial grasses). • Predation by feral or domestic dogs and foxes. • Vehicle strike. The main threat to Koala in NSW is clearing or modification of native vegetation (NSW Scientific Committee 2001) and urbanisation leading to an increased risk of predation and vehicle interaction. The proposal will result in the removal of up to 7.52 ha of vegetation containing Koala habitat from the edges of Picton Road and the M31 Hume Motorway. Removal of vegetation will contribute to the KTP Clearing of native vegetation, however the scale and position of the vegetation removal required is unlikely to significantly contribute to this KTP, in the context of the habitat available in the broader locality. At current, Picton Road and the M31 Hume Motorway provide a high risk of vehicle interaction and potential mortality from vehicle strike to Koala. Mitigation measures will reduce the risk of vehicle collision during construction. While the proposed works will improve vehicle movement through the Picton Road interchange, the works are not expected to increase traffic on these roads. Therefore, the proposed works are unlikely to contribute to the KTP of vehicle strike. Mitigation measures during construction will include hygiene protocols to prevent transfer of weeds and pathogens in soil.
Conclusion.

Test of Significance for Koala
In consideration of the above five factors, the proposed works is not likely to significantly impact Koala within the study area or wider locality, as: • A small portion of the overall habitat within the locality will be impacted because of the proposed works (7.52 ha of foraging habitat, within a linear corridor along existing roads). • The proposed works are not considered likely to result in fragmentation or isolation of habitat or populations of Koala. • The habitat is not considered of high importance within the broader locality, due to the position of habitat to be impacted which adjoins existing road infrastructure. • The proposed works will not significantly contribute to KTPs for the species. Therefore, no further assessment is required and a SIS or BDAR is not required.

Appendix D: Assessments of significance (EPBC Act)

The following *section provides for Significant Impact Criteria assessments according to the criteria outlined in the Matters of National Environmental Significance Significant impact guidelines 1.1* for all species determined as having a medium likelihood of occurrence (or greater) and may potentially be impacted by the works.

Threatened Ecological Communities

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest

The Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest is listed as a CEEC under the EPBC Act. This community includes the grassy eucalypt shale hills and plains woodlands, as well as the shale-gravel transition forests typically found within the Sydney Basin bioregion, primarily within the Cumberland sub-bioregion. The CEEC ranges from grassy woodland to forest, where its canopy is often dominated by Coastal Grey Box *Eucalyptus moluccana*, Forest Red Gum and/or Red Ironbark *Eucalyptus fibrosa*, however other canopy species may be present alongside these Eucalypts or locally dominant depending on the site. A small tree layer of juvenile Eucalypts and Acacia may be present, over an understory of perennial native grasses and other native species, sometimes including a shrub layer of Blackthorn. This community provides habitat for a range of species, including the Cumberland Plain Land Snail, which is listed as Endangered under the BC Act.

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest in the study area

Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest aligns with PCT 849 in a moderate condition within the study area. A total of 4.01 hectares of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest occurs within the proposal site, which is subject to assessment under the EPBC Act.

SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
Reduce the extent of an ecological community.
The total extent of the Cumberland Plain Shale Woodland and Shale-Gravel Transition Forest was estimated to cover approximately 12,300 ha in 2009 (Threatened Species Scientific Committee 2009). The local occurrence of Cumberland Plain Woodland includes the vegetation directly impacted by the proposed works, as well as the vegetation (PCT 849) within a 500 m buffer of the study area. The local occurrence of the community is 44.81 ha. The proposed works will result in the direct removal of up to 4.01 ha of Cumberland Plain Woodland, which represents approximately 8.94 % of the communities' local occurrence. It should also be mentioned that impacts primarily occur in a linear nature, predominantly affecting the edges of larger patches. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. In addition, the vegetation within the proposal site is already subject to significant disturbance and edge effects due to the existing road corridor, and farming practices in the adjacent lots. With the consideration that impacts are primarily in a linear nature, it is unlikely that the proposed works will significantly reduce the extent of the ecological community within the locality. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities.
Fragment or increase fragmentation of an ecological community.
The local occurrence of the community is 44.81 ha. The proposed works will result in the direct removal of up to 4.01 ha. The proposed works will involve widening of the existing road corridor to accommodate increased traffic, improve safety and increase the efficiency of freight travelling between regions. As the works involve widening of the existing road corridor, the vegetation to be removed is restricted to the area within and surrounding the road verge, on the edge of existing patches of vegetation. The proposed works will "push back" edge effects such that new areas will likely be subject to additional weed encroachment, however, the works will occur on the edge of the patch of the CEEC and will not likely exacerbate fragmentation. The remaining landscape is characterised by scattered, small to moderate sized patches of the CEEC, where its extent has been significantly reduced over time by surrounding agricultural and infrastructural land use. These patches are currently subject to edge effects and disturbance through weed encroachment within the understorey. These areas occur

SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
outside of the proposal site and would remain unaffected by the proposed work. Therefore, the proposed works are unlikely to significantly increase fragmentation of Cumberland Plain Woodland within the study area.
Adversely affect habitat critical to the survival of an ecological community.
No critical habitat has been declared within the Approved Conservation Advice and listing advice for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (Department of the Environment, Water, Heritage and the Arts 2009). The proposal would result in the removal of up to 4.01 hectares of edge affected Cumberland Plain Shale Woodland and Shale-Gravel Transition Forest along the existing road corridor. The CEEC within the study area is in a moderate conditional state and does not support any components considered critical in the survival of the CEEC in the locality. Given the already fragmented distribution of this community, and the localised nature of the proposed work, it is unlikely that the removal of up to 4.01 hectares if the CEEC will have a significant adverse effect on this communities' survival, which represent 8.94 % of the local occurrence. Impacts primarily occur in a linear nature, predominantly affecting the edges of existing larger patches of the CEEC. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. When considered at a landscape scale, 4.01 hectares is not considered likely to cause serious or long-term impacts on habitat critical to the survival of the community in a broader context.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.
Potential changes in surface water drainage patterns have the potential to occur due to construction, however, it is anticipated that it is likely to be minor. The proposed works is unlikely to result in surface water changes to the degree that would cause regular flooding or prolonged drying out of soils to adversely impact vegetation. Therefore, it is unlikely that the proposal would cause substantial modification to abiotic factors necessary for the community's survival.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.
The proposed works are mostly restricted to areas of past disturbance within road verges, private lots along Picton Road and vegetation parallel the existing road corridor. Although the proposed works will involve the removal of up to 4.01 hectares of this community, impacts primarily occur in a linear nature, predominantly affecting the edges of larger patches. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. While the proposed works will result in the removal of some functionally important species within this community, the vegetation to be removed within the proposal site extends beyond the study area and likely won't experience any significant change in composition, and biotic processes such as seed dispersal will continue to occur. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. Therefore, the proposed works are unlikely to cause a substantial change in species composition of an occurrence of the CEEC.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: **- Assisting invasive species establishment** **- Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**
The Cumberland Plain Shale Woodland and Shale-Gravel Transition Forest vegetation in the study area is currently subject to a moderate level of weed ingress. The vegetation is also currently subject to edge effects and potential effects from fertilizers and other pollutants from adjacent agricultural and urban development. The proposal is confined to the area along the road corridor, which has been subject to previous disturbance. There is potential for the establishment of exotic species on the edges of the new road verge; however, the mitigation measures provided in section 6 of this report would aid the avoidance of exotic species establishment. In addition, the proposed works would only impact vegetation adjacent to an existing road

SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
corridor on the edges of existing vegetation, the proposed works would not "open up" habitat or create new corridors of open vegetation that may allow exotic species to become established in an area that was previously inaccessible. Machinery or vehicles required for the construction process may contribute to additional erosion or the release of pollutants or chemicals; however, it is not expected to substantially higher than the level currently operating within the area. Additional mobilisation of fertilisers or herbicides as a result of the proposed works are not expected to be substantial enough to kill or inhibit the growth of species in the ecological community. In addition, areas of this community outside of the study area and across the broader landscape would remain largely unaffected by the proposed works. Although the works may contribute to localised erosion or the release of pollutants, it is not expected to be substantial. Therefore, the proposed works are unlikely to cause a substantial reduction in the quality or integrity of the CEEC.
Interfere with the recovery of an ecological community.
Currently, there is no Commonwealth Recovery Plan for this ecological community. However, the Approved Conservation Advice is considered an effective tool to guide the management and mitigation of threats to this CEEC (DCCEEW 2009). Management actions outlined in the conservation advice include: • Identify sites of high conservation priority. • Implement appropriate management regimes to maintain the biodiversity, including threatened species, of the ecological community. • Develop and implement best practice standards for management of remnants on private and public lands. • Manage any changes to hydrology that may result in changes to water table levels. In addition, develop and implement urban stormwater management guidelines that address risks of urban run-off to the ecological community. • Manage sites to prevent introduction or further spread of invasive weeds, which become a threat to the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest ecological community, using appropriate methods. • Develop and implement a management plan for the control of African Olive in the region. • Investigate options to maintain and improve connectivity of remnants, including the protection of paddock trees and replanting of key canopy tree species in derived grasslands and shrublands, where possible. The proposed works is considered unlikely to interfere with the priority actions of the conservation advice.
Conclusion.
Based on the assessment provided above, it is concluded the proposed works is unlikely to lead to a significant impact towards Cumberland Plains Shale Woodland and Shale Transition Forest. This conclusion can be made on the basis that: • The proposed works would not adversely impact critical habitat for Cumberland Plains Shale Woodland and Shale Transition Forest. • The proposed works is unlikely to cause fragmentation of the CEEC. • The proposed works is unlikely to cause a substantial change in the composition of the CEEC. • The proposed works is unlikely to significantly reduce the total extent of the CEEC. • The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities.

SIC assessment for Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
Considering the above, no further assessment is required.

Shale Sandstone Transition Forest in the Sydney Basin Bioregion

A description of this community is provided in the Test of Significance assessment under the BC Act.

Shale Sandstone Transition Forest in the study area

Shale Sandstone Transition Forest aligns with PCT 1395 in a low, moderate and high condition within the study area. A total of 6.59 hectares of Shale Sandstone Transition Forest occurs within the proposal site, which is subject to assessment under the EPBC Act.

SIC assessment for Shale Sandstone Transition Forest in the Sydney Basin Bioregion
Reduce the extent of an ecological community.
The total extent of the Shale Sandstone Transition Forest in the Sydney Basin Bioregion was estimated to cover approximately 9,642 ha in 2010 (NSW Scientific Committee 2014). The local occurrence of Shale Sandstone Transition Forest includes the vegetation directly impacted by the proposed works, as well as the vegetation (PCT 1395) within a 500 m buffer of the study area. The local occurrence of the community is 171.62 ha. The proposed works would result in the direct removal of up to 6.59 ha of Shale Sandstone Transition Forest, which represents approximately 4.27 % of the communities' local occurrence. It should also be mentioned that impacts primarily occur in a linear nature, predominantly affecting the edges of larger patches. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. In addition, the vegetation within the proposal site is already subject to significant disturbance and edge effects due to the existing road corridor, and farming practices in the adjacent lots. The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. In addition, the vegetation within the proposal site is already subject to significant disturbance and edge effects due to the existing road corridor, and farming practices in the adjacent lots. Although additional clearing of the CEEC has occurred since 2009, removal of up to 6.59 hectares is not considered likely to significantly reduce the extent of Cumberland Plain Shale Sandstone Transition Forest in the locality.
Fragment or increase fragmentation of an ecological community.
The CEEC is concentrated around the Nepean River and parts of the study area in proximity to waterways. The Nepean River corridor supports large areas of intact, contiguous vegetation that extends along the river and other adjoining waterways. The proposed works would involve upgrades to existing road infrastructure, specifically the widening of the roadway to create more lanes for increased traffic. As the works involve widening of the existing road corridor, the vegetation to be removed is restricted to the area within and surrounding the road verge, on the edge of existing patches of vegetation. The removal of up to 6.59 ha of Shale Sandstone Transition Forest within the road verge will not divide large areas of habitat, nor will it 'open up' habitat such that a patch of vegetation may become isolated from other areas habitat. In addition, large contiguous patches of higher-quality vegetation around the Nepean River would maintain connectivity, and the localised nature of the works would not significantly divide vegetation such that a patch of habitat may become isolated from surrounding areas of habitat, and connectivity would be maintained throughout the landscape. Therefore, the proposed works are unlikely to significantly increase fragmentation of Shale Sandstone Transition Forest within the study area.
Adversely affect habitat critical to the survival of an ecological community.
No critical habitat has been declared within the Approved Conservation Advice and listing advice for Shale Sandstone Transition Forest in the Sydney Basin Bioregion (DoE 2014a). The proposal would result in the removal of up to 6.59 hectares of edge affected Shale Sandstone Transition Forest along an existing road corridor. The CEEC exists in a high to low condition within the study area, where the high-quality vegetation supports an intact canopy, well-balanced community structure and minimal weed disturbance. The Shale Sandstone Transition Forest mapped within the open areas of the study area likely do not provide habitat critical to the survival of an ecological community, due to fragmentation, low species diversity and high levels of weed invasion. The majority of Shale Sandstone Transition Forest CEEC (6.59 ha) to be removed is in a moderate to low condition along the existing road corridor, and therefore is mostly subject to weed ingress and edge effects. These areas are not considered

SIC assessment for Shale Sandstone Transition Forest in the Sydney Basin Bioregion
critical to the survival of the community. Impacts primarily occur in a linear nature, predominantly affecting the edges of existing larger patches of the CEEC. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. In addition, the composition of the remaining CEEC that extends beyond the study area is likely to remain unchanged and biotic processes such as seed dispersal would continue to occur. Taking this into consideration, the proposed works would be unlikely to cause serious or long-term impacts on habitat critical to the survival of the community at a broader scale.
Modify or destroy abiotic factors necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns.
Indirect impacts associated with construction such as potential changes in surface water drainage patterns may occur within the study area. However, any changes in hydrology are expected to be minor and would be unlikely to have any substantial adverse impact on the CEEC. Therefore, it is unlikely that the proposed works would cause substantial modification to abiotic factors necessary for the community's survival.
Cause a substantial change in the species composition of an occurrence of an ecological community, including a decline or loss of functionally important species, for example through regular burning or flora and fauna harvesting.
The proposed works would occur along an existing road corridor and private lots in areas subject to edge effects. The CEEC to be removed is present in a low to high condition, with varying levels of weed disturbance as well as native species diversity and abundance. The proposed works would involve the removal of up to 6.59 hectares of this community along the road corridor, which would reduce the local extent as well as potentially result in additional edge effects and weed invasion in the new road verge. Impacts primarily occur in a linear nature, predominantly affecting the edges of larger patches. Hence, while these impacts may give the impression of sizeable disturbances, it is important to note that the removal is not substantial when considering the broader context. The proposed works has the potential to contribute to minor fragmentation and result in the removal of some functionally important species within this community, however, significant changes in composition of the local occurrence of the CEEC is unlikely. The CEEC to be removed is contiguous with higher quality vegetation that extends beyond the study area, which would remain unaffected by the proposed works The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities. Therefore, the proposed works would be unlikely to cause a substantial change in species composition within the community.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to: **- Assisting invasive species establishment** **- Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**
The Shale Sandstone Transition Forest in the study area is currently subject to edge effects and potential effects from fertilizers and other pollutants from adjacent agricultural and urban development. The proposal is confined to the area along the road corridor, which has been subject to previous disturbance. There is potential for the establishment of exotic species on the edges of the new road verge, however mitigation measures outlined in section 6 of this report would aid the avoidance of exotic species establishment. In addition, the proposed works would only impact vegetation adjacent to an existing road corridor on the edges of existing vegetation, the proposed works would not "open up" habitat or create new corridors of open vegetation that may allow exotic species to become established in an area that was previously inaccessible. Machinery or vehicles required for the construction process may contribute to additional erosion or the release of pollutants or chemicals; however, it is not expected to substantially higher than the level currently operating within the area. Additional mobilisation of fertilisers or herbicides as a result of the proposed works are not expected to be substantial enough to kill or inhibit the growth of species in the ecological community. In addition, areas of this community outside of the study area and

SIC assessment for Shale Sandstone Transition Forest in the Sydney Basin Bioregion
across the broader landscape would remain largely unaffected by the proposed works. Although the works may contribute to localised erosion or the release of pollutants, it is not expected to be substantial. Therefore, the proposed works are unlikely to cause a substantial reduction in the quality or integrity of the CEEC.
Interfere with the recovery of an ecological community.
Currently, there is no Commonwealth Recovery Plan for this ecological community. However, the Approved Conservation Advice provides recovery strategies and management to combat threats to this CEEC (DCCEEW 2009). Management actions with the highest priority include: • Avoid further clearance and fragmentation of patches of the ecological community and surrounding native vegetation, including derived grasslands/shrublands. • Minimise impacts from any developments and activities adjacent to patches that might result in further degradation (for example by applying buffer zones). • Protect mature trees with hollows and plant native hollow producing species. Ensure that trees are always left to grow to maturity and if necessary place artificial hollows (e.g. nest boxes) in or near to the ecological community and monitor outcomes. • Retain fallen logs as habitat for fauna (and add logs to areas where they have been removed), noting different log requirements for different species e.g. logs embedded in the soil are necessary for some species and hollow logs are required by other species. • Retain other native vegetation remnants, derived grasslands or shrublands and paddock trees near patches of the ecological community and create or restore wildlife corridors and linkages. • Implement appropriate management regimes and best practice standards to maintain the biodiversity, including listed threatened species, of patches of the ecological community on private and public lands. • Integrate fire and grazing management regimes (see also separate actions below regarding grazing and fire). • Manage any changes to hydrology or disruptions to water flows that may result in changes to water table levels and/or increased run-off, salinity, sedimentation or pollution. • Manage any other known, potential or emerging threats such as rural tree dieback. The proposed works is considered unlikely to significantly interfere with the priority actions of the conservation advice.
Conclusion.
Based on the assessment provided above, it is concluded the proposed works is unlikely to lead to a significant impact towards Shale Sandstone Transition Forest. This conclusion can be made on the basis that: • The proposed works would not adversely impact critical habitat for Shale Sandstone Transition Forest. • The proposed works is unlikely to cause fragmentation of the CEEC. • The proposed works is unlikely to cause a substantial change in the composition of the CEEC. • The proposed works is unlikely to significantly reduce the total extent of the CEEC. • The potential reduction in impacts from recommended mitigation measures have not been considered as part of the significant impact assessment. However, implementing them would contribute towards reducing the impacts from the proposal on threatened species and ecological communities.

SIC assessment for Shale Sandstone Transition Forest in the Sydney Basin Bioregion
Considering the above, no further assessment is required.

Threatened flora

Thick Lip Spider Orchid *Caladenia tessellata* – Vulnerable species EPBC Act

Thick Lip Spider Orchid is listed as Vulnerable under the Commonwealth EPBC Act. This species is a perennial orchid that sprouts annually from an underground tuber (DCCEEW 2022a). It has a single slender flowering stem which bears one or two 3 cm yellow-green flowers (with maroon stripes and suffusions), is hairy and grows to 30 cm in height. The Thick-lipped Spider-orchid is endemic to mainland south-east Australia (NSW Threatened Species Scientific Committee 2002). It is distributed from the central coast of NSW to the Westernport region of southern Victoria. The species usually occurs on or near the coast, but in southern NSW it extends well inland to Braidwood

Historically, the Thick-lipped Spider-orchid was relatively widespread in coastal areas between Newcastle in NSW and Westernport in Victoria. Herbarium records of the species exist from Sydney, the Royal National Park, Queanbeyan, Heathcote, Huskisson, Ulladulla, Jervis Bay and Wyong in NSW. However, plants have not been seen at most of these sites for several years, and the species has suffered a substantial decline in overall abundance. Destruction of habitat, largely for urban and industrial development, is the cause of this historic decline (DSE 2010).

Thick Lip Spider Orchid within the study area

Whilst Thick Lip Spider Orchid is a BAM candidate species, no records of this species occur within 10 kilometres from the study area, with the closet being approximately 40 kilometres north-west. Targeted survey during the optimal survey period (September – October) was completed across the study area. However, three properties, Lot 7 in DP 1280088, Lot 16 in DP251051 and Lot 18 in DP251051, were not subject to targeted surveys for this species, due to access constraints. Vegetation within these lots provides potential habitat for Thick Lip Spider Orchid and comprises PCT 849, PCT 1395 and PCT 1181.

A self-assessment of whether the proposed works is likely to lead to a significant impact on Thick Lip Spider Orchid is provided below.

SIC assessment for Thick Lip Spider Orchid
Lead to a long-term decrease in the size of a population.
Due to access constraints, the completed targeted surveys did not cover approximately 1.26 ha of native vegetation. This vegetation, which may provide habitat for the Thick Lip Spider Orchid, would be impacted by the project. Whilst the un-surveyed vegetation that would be impacted is associated with the species, Bionet records suggest that the general distribution of Thick Lip Spider Orchid populations occur closer to the coast. No records of the species occur within 10 km of the study area, with the closest being approximately 39 km to the north-east in the surrounds of Sydney. The lots that were missed during targeted surveys are also contiguous with a larger intact patch of vegetation that surrounds the riparian corridor of the Nepean River. Within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present, which provides equally suitable habitat to the vegetation that would be removed. Based on the lack of recorded individuals within the remainder of the study area and locality, it is unlikely that the un-surveyed areas would harbor a population of the species. Even if a population were to exist, the presence of surrounding intact vegetation means that any potential impact would be minimal, and any populations that do exist would likely not experience a substantial decrease in size. Considering the above, it is considered unlikely that the proposed works would lead to a long-term decrease in the size of a population of the species.
Reduce the area of occupancy of an important population.
There has not been any formally approved conservation advice released for the species, and therefore no important populations have been identified. Nonetheless, the national recovery plan for the species states that within NSW and Victoria, the Thick-lip Spider-orchid is known from 19 populations containing about 450 plants, with the closest population occurring in Wyrrabalong National Park, approximately 175 km north (South of Newcastle). Despite the presence of suitable habitat, no records of the species occur within 10km. In addition, no individuals were found within areas that underwent

SIC assessment for Thick Lip Spider Orchid
targeted surveys. Furthermore, the area of potential habitat to be impacted is contiguous with a larger intact patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River, which provides equally suitable habitat to the vegetation being removed. Within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present. These areas provide equally suitable habitat to the vegetation being removed and would continue to provide habitat post works. Based on the lack of records in the surrounding area, it appears unlikely that the un-surveyed areas would harbor a population of the species. Therefore, the proposed works would not reduce the area of occupancy for any important populations.
Fragment an existing population into two or more populations.
The proposed works would involve the removal of up to approximately 1.26 ha of vegetation that was not subject to targeted surveys for the species. However, it is worth noting that the remaining proposal site underwent intensive targeted survey and no individual specimens of the species were recorded. It should also be noted that the area to be cleared is contiguous with a larger, well-preserved patch of vegetation surrounding the Nepean River riparian corridor. To elaborate, within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present. These areas provide equally suitable habitat to the vegetation being removed. Considering this, impacts to the small and linear sections left un-surveyed are unlikely to lead to further fragmentation or isolation of Thick Lip Spider Orchid, even if unidentified individuals are affected. Furthermore, given that no locally occurring populations are known, the extent of habitat that would be affected is relatively small, and the resulting impact is not considered significant. Therefore, the proposed works would not fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of a species.
Critical habitat has not been declared for Thick Lip Spider Orchid.
Disrupt the breeding cycle of an important population.
As previously mentioned, no important populations have been declared for the species, with the closest known population occurring in Wyrrabalong National Park, approximately 175 km north (South of Newcastle). Little is known about Thick Lip Spider Orchid's life cycle. The species is dormant in summer and emerges in late autumn to early winter in response to soaking rains. The orchid typically flowers from late September to early November, and fruits take 5-8 weeks to mature following pollination. The species relies on seed production for reproduction and forms a complex relationship with a mycorrhizal fungus. Pollination is likely via pseudocopulation, and the species' response to fire is not well understood. Considering the above, any disturbances to the soil in areas where a population occurs could potentially disrupt the breeding cycle for the species. However, when considering that no records occur within 10km, areas subject to targeted surveys didn't record the species, it is unlikely that the study area contains any unknown populations. Therefore, the proposed works would not disrupt the breeding cycle for the species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Due to access constraints, targeted surveys could not be conducted during the optimal survey period for approximately 1.26 ha of vegetation. Therefore, it is not possible to rule out the occurrence of the species within this vegetation, and that the removal would not result in impacts towards the species. The proposal would require clearing of vegetation within the proposal site, which would reduce potential habitat availability for the species in the immediate vicinity. Whilst these lots were not surveyed, effort was made to complete visual inspections from adjacent areas where possible. The area that would be impacted exists as small, linear areas with similar condition habitat to other surveyed areas. While the three lots were not subject to targeted surveys, the remaining proposal site underwent thorough surveys, and no individual specimens of the species were recorded. Non-surveyed vegetation to be impacted is also contiguous with a larger intact patch of vegetation that surrounds the rocky outcrops and riparian corridor of the Nepean River. To elaborate, within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present. These areas provide equally suitable habitat to that being removed and would continue to provide habitat post works. No records of the species occurs within 10 km of the study area, with the closest being approximately 39 km to the north-east in the surrounds of Sydney. The absence of recorded specimens in the surveyed area combined with linear nature of the

SIC assessment for Thick Lip Spider Orchid
proposal site and presence of surrounding intact vegetation, implies that the proposed works are unlikely to have significant impacts on the habitat of the species. Considering the above, it is unlikely that the removal of vegetation or any potential unknown individuals during the works would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
Measures have been suggested in this report to control weed ingress in the study area during the proposed works, reducing the possibility of competition from the weeds currently present. Therefore, the proposed works is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to Thick Lip Spider Orchid. The proposed works would not 'open up' habitat that was previously inaccessible to invasive species and as such is unlikely to exacerbate the current level of invasive species threat operating within the study area to the point that they become harmful to Thick Lip Spider Orchid.
Introduce disease that may cause the species to decline.
Recommendations have been made that all equipment used throughout the duration of the proposed works, including PPE, will be cleaned prior to entering or leaving the work sites. This would prevent the spread of any known diseases and therefore the proposed work is unlikely to introduce a disease that causes any Thick Lip Spider Orchid population to decline.
Interfere substantially with the recovery of the species.
A Recovery Plan has not been prepared for Thick Lip Spider Orchid, nor has any approved Conservation Advice been completed. However, the national recovery plan for the species identifies several relevant conservation actions for the recovery of the species: • Ensure that all populations and their habitat are protected and managed appropriately • Manage threats to populations Considering that no records of the species occur within 10km and no individuals were found within the 18.58 ha of areas that underwent targeted surveys, it is unlikely that the un-surveyed areas would harbor a population of the species. Even in the case that unidentified individuals are present, the level of impact from the proposed works is unlikely to interfere with any if the above conservation actions.
Conclusion.
Based on the assessment provided above, it is concluded the proposed works is unlikely to lead to a significant impact towards Thick Lip Spider Orchid. This conclusion can be made on the basis that: • No important populations would be impacted by the proposed works • The proposed works are unlikely to cause fragmentation of the species • The proposed works are unlikely to disrupt the breeding cycle of the species • The proposed works are unlikely to result in the introduction of invasive species or diseases. Considering the above, no further assessment is required.

Sydney Plains Greenhood *Pterostylis saxicola* – Endangered species EPBC Act

The Sydney Plains Greenhood is listed as endangered and is a tuberous orchid with translucent flowers, found only in the greater Sydney region of New South Wales, including suburbs such as Georges River National Park, Ingleburn, Holsworthy Military Area, Peter Meadows Creek, and St Marys Towers near Douglas Park, and between Picnic Point and Picton (NSW

Scientific Committee 1977). It grows in heathy forests or woodlands on sandy soil over sandstone rock shelves, usually near streams. The species typically grows as scattered individuals or in small groups at altitudes between 10 and 60 metres.

The major risks faced by the Sydney Plains Greenhood include loss and deterioration of its habitat due to development, uncontrolled grazing, weed encroachment, and unsuitable fire management practices. Additionally, the plant is threatened by feral pigs that cause damage to the plants and their habitat. Due to its limited distribution and small population size, this species is vulnerable to extinction from environmental and demographic uncertainties and catastrophic events (Jones and Clements 1997).

Sydney Plains Greenhood within the study area

Only one old record of Sydney Plains Greenhood occurs within 10 kilometres of the study area. Targeted survey during the optimal survey period (September – October) was completed across the study area, however, three properties, Lot 7 in DP 1280088, Lot 16 in DP251051 and Lot 18 in DP251051, were not subject to targeted surveys for this species, due to access constraints. Vegetation within these lots provides potential habitat for Sydney Plains Greenhood, and consists of PCT 849, PCT 1395 and PCT 1181.

A self-assessment of whether the proposed works is likely to lead to a significant impact on Sydney Plains Greenhood is provided below.

SIC assessment for Sydney Plains Greenhood
Lead to a long-term decrease in the size of a population.
Due to access constraints, the completed targeted surveys did not cover approximately 1.26 ha of native vegetation that would be removal as part of the proposed works. Whilst the un-surveyed vegetation that would be impacted is associated with the species, the approved conservation advice for the species states that known populations occur closer to Sydney and is only known from five populations, which are located at the following locations; Georges River National Park, Ingleburn, Holsworthy, Peter Meadows Creek and St Marys Towers. Among the populations of the Sydney Plains Greenhood, the St Marys Towers population is the nearest, located about 15km north-east. However, within a 10km radius of the research area, only one instance of the species has been recorded, and no individuals were found within areas that underwent targeted surveys. The lots that were missed during targeted surveys are also contiguous with a larger intact patch of vegetation that surrounds the riparian corridor of the Nepean River. Within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present which provides equally suitable habitat to the vegetation being removed. Based on the lack of recorded individuals within the remainder of the study area and locality, it is unlikely that the un-surveyed areas would harbor a population of the species. Even if a population were to exist, the presence of surrounding intact vegetation means that any potential impact would be minimal, and any populations that do exist would likely not experience a substantial decrease in size. Considering the above, it is considered unlikely that the proposed works would lead to a long-term decrease in the size of a population of the species.
Reduce the area of occupancy of the species
The proposed works would involve the removal of up to approximately 1.26 ha of vegetation. It is worth noting that the remaining proposal site underwent thorough surveys, and no individual specimens of the species were recorded. In the worst-case scenario that unidentified individuals are present in un-surveyed areas, the area to be cleared is contiguous with a larger patch of well-preserved vegetation surrounding the Nepean River riparian corridor. Given the presence of this intact vegetation, the impacts for the proposed works, which are of a linear nature, occurring adjacent to road corridors, is unlikely to be significant. Therefore, the proposed works is unlikely to reduce the area of occupancy for the species.
Fragment an existing population into two or more populations.
The proposed works would involve the removal of up to approximately 1.26 ha of vegetation that was not subject to targeted survey for the species. However, it is worth noting that the remaining proposal site underwent intensive targeted survey, and no individual specimens of the species were recorded. It should also be noted that the area to be cleared is contiguous with a larger, well-preserved patch of vegetation surrounding the Nepean River riparian corridor. To elaborate, within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present. These areas provide equally suitable habitat to the vegetation being removed. Therefore, any impact on the small and linear sections that were not surveyed is unlikely to lead to further fragmentation or isolation of Sydney Plains greenhood, even if unidentified individuals are affected. Moreover, since there are no known local populations, and the extent of habitat that would be impacted is relatively small, the resulting

SIC assessment for Sydney Plains Greenhood
impact is not considered significant. Thus, the proposed works would not divide an existing population of Sydney Plains greenhood into two or more populations.
Adversely affect habitat critical to the survival of a species.
Critical habitat has not been declared for Sydney Plains greenhood.
Disrupt the breeding cycle of a population.
The life cycle of the Sydney Plains greenhood is similar to other *Pterostylis* species. After seeds gave been scattered, the visible parts of the plant decay and perish, and the plant survives as a tuber until the following year. The species has been shown to be influenced by climatic conditions. Considering the above, any disturbances to the soil in areas where a population occurs could potentially disrupt the breeding cycle for the species. However, when considering that limited records occur within 10km and that areas subject to targeted surveys didn't record the species, it is unlikely that the study area contains any unknown populations. Therefore, the proposed works would not disrupt the breeding cycle for the species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Due to access constraints, the completed targeted surveys did not cover approximately 1.26 ha of native vegetation. The un-surveyed vegetation that is to be impacted exists as linear strips adjacent to road corridors, and the remaining study area underwent thorough surveys with no recorded specimens of the species. The lots that were missed during targeted surveys are also contiguous with a larger intact patch of vegetation that surrounds the riparian corridor of the Nepean River. Within a 1500 m buffer of the study area, approximately 2,196 ha of native vegetation is present which provides equally suitable habitat to the vegetation being removed. Based on the absence of recorded specimens in the surveyed area, the linear nature of the proposal site, and the presence of surrounding intact vegetation, it is unlikely that the proposed works would significantly impact the species' habitat. Therefore, the removal of vegetation or any potential unknown individuals during the works is unlikely to reduce the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.
Measures have been proposed in this report to control weed ingress in the study area during the proposed works, reducing the possibility of competition from the current weeds. Therefore, the proposed works is unlikely to worsen the current level of invasive species threat in the study area to a point where they become harmful to the Sydney Plains Greenhood. The proposed works would not create new accessible areas for invasive species, and as a result, it is unlikely to increase the current level of invasive species threat in the study area to a point where they become harmful to the Sydney Plains Greenhood.
Introduce disease that may cause the species to decline.
Recommendations have been made that all equipment used throughout the duration of the proposed works, including PPE, will be cleaned prior to entering or leaving the work sites. This would prevent the spread of any known diseases and therefore the proposed work is unlikely to introduce a disease that causes any Sydney Plains Greenhood population to decline.
Interfere substantially with the recovery of the species.
A Recovery Plan has not been prepared for Sydney Plains Greenhood. However, the approved Conservation Advice identifies several relevant conservation actions for the recovery of the species: • Ensure road widening and maintenance activities or other infrastructure or development activities involving substrate or vegetation disturbance in areas where Sydney Plains Greenhood occurs do not adversely impact on known populations.

SIC assessment for Sydney Plains Greenhood
• Manage any changes to hydrology that may result in changes to the water table levels, increased run-off, sedimentation, or pollution. • Ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on Sydney Plains Greenhood The proposed works may slightly interfere with one of the above conservation actions due to the works requiring the widening roads within potential habitat. However, the works would not disrupt any known populations and the works are therefore unlikely to significantly impact the recovery of the species.
Conclusion.
Based on the assessment provided above, it is concluded the proposed works is unlikely to lead to a significant impact towards Sydney Plains Greenhood. This conclusion can be made on the basis that: • No important populations would be impacted by the proposed works • The proposed works are unlikely to cause fragmentation of the species • The proposed works are unlikely to disrupt the breeding cycle of the species • The proposed works are unlikely to result in the introduction of invasive species or diseases. Considering the above, no further assessment is required.

Threatened fauna

Large-eared Pied Bat *Chalinolobus dwyeri*

The Large-eared Pied Bat is a medium-sized insectivorous bat measuring a total length of approximately 100 millimetres and weighing 7–12 grams (Hoye and Dwyer 1995). The species is listed as Vulnerable under the EPBC Act. The species' current distribution is poorly known. Records exist from Shoalwater Bay, north of Rockhampton, Queensland, through to Ulladulla on the south coast of NSW (Hoye 2005). Despite the large range, it has been suggested that the species is far more restricted than previously thought (DECC 2007). Available records suggest that the largest concentrations of populations appear to be in the sandstone escarpments of the Sydney Basin and the north-west slopes. Although the species is widely distributed, it is uncommon and patchy within this area (DERM 2011).

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 (TSSC 2012). Almost all records have been found within several kilometres of cliff lines or rocky terrain (Hoye 2005). Roosting has also been observed in disused mine shafts, caves, overhangs and disused Fairy Martin *Hirundo ariel* nests (Hoye and Dwyer 1995).

Only four maternity roosts have been discovered in NSW, with two of these since abandoned due to flood and disturbance by macropods (Pennay 2008). The structure of maternity roosts appears to be very specific (arch caves with dome roofs). Caves need to be high and deep enough to allow juvenile bats to learn to fly safely inside and have indentations in the roof. Roosting bats cluster in these indentations, presumably to allow the capture of heat. These physical characteristics are very uncommon in the landscape and their scarcity presumably poses an important limiting factor in the distribution of the Large-eared Pied Bat (Pennay 2008).

Large-eared Pied Bat within the study area

Within a 10 kilometre radius of the study area, Large-eared Pied Bat has been recorded 37 times (DPE 2023g). Within the study area, acoustic calls with features characteristic of Large-eared Pied Bat were recorded from near the rocky cliff lines of the Nepean River gorge. The species is highly mobile and records in the locality are associated with vegetated riparian corridors, including the Nepean River. These riparian corridors form part of large patches of well-connected native vegetation, with suitable rock outcropping to support roosting features such as caves and overhangs. To the west, vegetation forms part of Nattai National Park, Yerranderie State Conservation Area and Blue Mountains National Park while to the south-east vegetation forms part of the Upper Nepean State Conservation Area and adjoining areas of the Illawarra escarpment.

While no potential breeding structures were identified during field assessment, it is noted that the inaccessible rocky cliff lines associated with the Nepean River gorge likely provide suitable roosting habitat, and may contain suitable breeding habitat. The species is therefore considered likely to be utilising the study area.

The proposed works would result in the loss of 10.46 ha of potential foraging habitat for Large-eared Pied Bat. This habitat consists of areas of native vegetation with an intact canopy located within 2 km of the Nepean River. An assessment of whether the proposed works are likely to lead to a significant impact on Large-eared Pied Bat is provided below.

SIC assessment for Large-eared Pied Bat
Lead to a long-term decrease in the size of an important population of a species.
The conservation advice for the species states that further work is required throughout the species' known range to determine the size and distribution of existing populations. There is currently insufficient information available to describe, with spatial information, important populations of Large-eared Pied Bat. Until such information is available, all populations of the species should be considered important due to their likely role in maintaining population connectivity and genetic diversity (DAWE 2021)
Available records for Large-eared Pied Bat suggest that the largest concentrations of populations occur within the sandstone escarpments of the Sydney Basin region as well as the north-west slopes (DAWE 2021, DCCEEW 2022b). Whilst there is a lack of information pertaining to the species movements and dispersal ability (DERM 2011), it is likely that the local population within the vicinity of the proposed works forms part of a larger population that is known to inhabit the Sydney Basin sandstone escarpments. Impacts likely to have an adverse effect on the life cycle of this population include direct mortality, loss of highly productive foraging habitat and destruction and interference with maternity roosts.
The proposed works include the removal of up to 10.46 ha of foraging habitat. This represents a small fraction of the available resources within the immediate locality as represented by remnant vegetation along Byrnes Creek, the Nepean River and within the Upper Nepean State Conservation Area. This is an even smaller fraction of the available habitat available to the

SIC assessment for Large-eared Pied Bat
broader population that occurs across the Sydney Basin area. Individuals occurring within the vicinity of the proposed works will need to fly further to forage; however, the removal does not represent a significant fragmentation of habitat such that individuals of this highly mobile species will not be able to traverse to nearby retained foraging habitats. The relatively small-scale removal of potential forging habitat and native vegetation supporting potential breeding habitat is unlikely to lead to a long-term decrease in the size of the important population that occurs within the Sydney Basin region. The proposed works would not impact on sandstone cliffs (which the species is dependent on for sheltering and breeding), would not limit the movements of the highly mobile Large-eared Pied Bat throughout the broader locality, nor would it significantly reduce the availability of foraging resources.
Reduce the area of occupancy of an important population.
The Large-eared Pied Bat has a patchy distribution with a population structure and number of population locations that are poorly known. The extent of occurrence for the species across its known distribution is estimated to be 280 000 km^2. However, the actual area of occupancy is significantly smaller, estimated to be 1,500 km^2, due to it being defined by the area supporting maternity roost sites (DAWE 2021). The proposed works occur within the Sydney Basin, which coincide with one of the largest known concentrations of records for the species. As such the works do not occur at the edge of the known area of occupancy for the species and would not result in a decrease at the edge of that area. The proposed works involve the small-scale removal of potential foraging habitat (10.46 ha). The proposed works would not involve impacts to the sandstone cliffs along the Nepean River gorge which may support potential roosting and maternity sites for the species. The removal of vegetation because of the proposed works is also unlikely to impact on the viability of such maternity roosts if present, given that availability of similar native vegetation that will still be present within the locality following completion of the works. The proposed works are therefore considered unlikely to significantly reduce the area of occupancy for Large-eared Pied Bat. The species will continue to forage and breed in retained habitat within the locality.
Fragment an existing important population into two or more populations.
The Large-eared Pied Bat is highly associated with rocky areas including caves, overhangs, escarpments, outcrops or crevices, upon which it is heavily reliant for sheltering and roosting. Almost all records for the species occur within several kilometres of these features (DPE 2023a, DAWE 2021). Within the Sydney Basin these features are heavily associated with the sandstone escarpment of the Nepean River gorge. The proposed works would result in the removal of native vegetation from an area directly adjacent to these features. These impacts are linear in nature, and are associated with a pre-existing disturbance corridor within the locality (i.e. the existing alignment of Picton Road). Whilst the proposed work would widen this corridor, this additional width does do not represent a significant break in habitat such that species movements would be prevented. Similarly, the proposed works would not prevent the movement of any individuals through the gorge areas of the Nepean River. As such the proposed works are unlikely to result in the fragmentation of a population into two or more populations.
Adversely affect habitat critical to the survival of a species.
The conservation advice for this species notes that *it is not practicable to describe habitat critical to the survival of this species* (DAWE 2021). There are large areas of potential habitat for the species which are un-surveyed and for which occupancy is not confirmed. The species eligibility for listing and key threat being the loss, degradation and fragmentation of habitat suggest that all habitat for the species either now or at some point in the near future is likely to be critical to the survival of the species (DAWE 2021). However, the destruction and interference of maternity roosts and other roosts is likely to have the greatest immediate impact on the future survival of the species. The proposed works would not result in the destruction and interference of such features, nor is the small-scale removal of vegetation from surrounding areas likely to impact the viability of any such maternity roosts that may potentially be present in the locality.
Disrupt the breeding cycle of an important population.

SIC assessment for Large-eared Pied Bat
Large-eared Pied Bat is dependent on rocky areas including caves, overhangs, escarpments, outcrops or crevices for breeding. However, the number of known breeding sites is limited and the structure of maternity roosts appears to be very specific (consisting of arch caves with dome roofs). There would be no impacts to such features because of the proposed works. Whilst the proposed works would result in the removal of up to 10.46 ha of foraging habitat, this removal is unlikely to impact on the viability of a maternity roost if it were present within the locality.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
The proposed works would impact on 10.46 ha of foraging habitat for the species. The proposed impacts are to occur along a pre-existing road corridor and are adjacent to large tracts of good quality bushland. Large areas of foraging resources will still be present within the area which will be available to the highly mobile species. Given the individuals within the locality are likely to form part of a larger population that occurs across the Sydney Basin area, that small-scale removal of habitat because of the proposed works is unlikely to result in the decline of the species within the region.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
The area surrounding the proposed works are likely to support several invasive animal species including Red Fox and feral Cats. The CEMP will detail monitoring and management measures to ensure that the presence of such species does not increase due to proposed works, for example through increases in rubbish that might attract pest species. Weeds occurring within the study area are common with those occurring within adjacent vegetation to be retained. As the vegetation to be retained is in similar condition, increased transport of pathogens and weeds is unlikely to occur. Regardless, measures to ensure adequate control of weeds and pathogens will be detailed and managed by biosecurity measures outlined in the CEMP. Overall, no increase in invasive animals or plants is predicted because of the proposed works.
Introduce disease that may cause the species to decline.
The IUCN Species Survival Commission released a statement on 19 June 2020 stating that there is a credible risk of human-to-bat transmission of SARS-Cov-2, a virus currently circulating the globe and causing a pandemic of the illness Covid-19 (IUCN SSC 2020). However, introduction of this disease to Large-eared Pied Bats within the study area because of the proposed works is unlikely for the following reasons: • No contact or sharing of closed areas between humans and bats is expected because of the proposed works. • Roosting habitat does not occur within the direct area of the proposed works. • The transmission of SARS-Cov-2 is considered unlikely because of the proposed works.
Interfere substantially with the recovery of the species.
The following recovery objectives have been specified within the National recovery plan for the Large-eared Pied Bat (DERM 2011): • Identify priority roost and maternity sites for protection. • Implement conservation and management strategies for priority sites. • Educate the community and industry to understand and participate in the conservation of the Large-eared Pied Bat. • Research the Large-eared Pied Bat to augment biological and ecological data to enable conservation management. • Determine the meta-population dynamics throughout the distribution of the Large-eared Pied Bat. One of the recovery actions stated under these objectives is the protection of known roosts and associated foraging habitats and management of threats. The proposed works would result in the removal of potential foraging habitat. Disturbance to

SIC assessment for Large-eared Pied Bat
foraging habitat may therefore interfere with this recovery action. However, no impacts to maternity sites would occur because of the proposed works. The small-scale nature of vegetation removal is therefore considered unlikely to interfere substantially with the recovery of the species.
Conclusion.
In consideration of the above significant impact criteria, the proposed works are not likely to significantly impact Large-eared Pied Bat within the locality, as: The proposed works would result in impacts to 10.46 ha of foraging habitat along a pre-disturbed corridor associated with Picton Road. Whilst this may impact on a small number of individuals, given the availability of similar resources to the population that exists within the Sydney Basin, impacts to these habitats are not considered to constitute a significant impact. • The proposed works would not result in any impacts to maternity roosts for the species. • The area of occupancy for an important population of the species would not be reduced. • The proposed works would not result in fragmentation of the Large-eared Pied Bat population that exists within the Sydney Basin. • Habitat critical to the survival of the species is not practicable for consideration with this species, as detailed in the conservation advice (DAWE 2021). However, the proposed works would not impact on maternity roosts. • The breeding cycle of the Sydney Basin Large-eared Pied Bat population would not be disrupted because of the proposed works. • The availability of quality habitat would not be reduced such that the species is likely to decline. • Populations of invasive species (foxes, cats, weeds, etc.) are unlikely to increase significantly because of the proposed works. • The proposed works are unlikely to result in the introduction of a disease that may cause the species to decline. • The proposed works are unlikely to interfere substantially with the recovery of the species. This assessment has determined that a significant impact because of the proposed works is therefore unlikely and that a referral to the minister is not recommended.

Koala *Phascolarctos cinereus*

Koala populations in Queensland, NSW and ACT are listed as Endangered under the EPBC Act. Koalas occupy a range of eucalypt-dominated forest and woodland types throughout their range, but favour habitats that support key forage species in more mesic microhabitats. Altitude (<800m ASL) and temperature restrict the Koalas distribution, as does leaf moisture at the western and northern ends of the range (Department of Sustainability, Environment, Water, Population and Communities, 2012).

Key threats to Koala include habitat fragmentation, predation by dogs, vehicle strikes and disease. Climate change may also be affecting Koala populations through increased temperatures causing heat stress and a reduction in the level of moisture within the leaves of browse trees.

Koala populations throughout Australia are currently under increased pressure due to the 2019-2020 summer bushfires that occurred across the southern and eastern states of Australia. The DAWE has provided several resources in response to these fires including analyses of listed species habitat within fire affected areas (DEE 2020), as well as provisional lists of fauna that require urgent management intervention (DAWE 2020). Twelve percent of the likely and known distribution of the combined Koala populations across Australia has been identified as occurring within fire affected areas, and Koala has been identified as one of the species requiring urgent management intervention. Given this context, any remaining areas of high-quality Koala habitat are now critical to the conservation of the species.

Occurrence in the study area

Previous records of Koalas exist within both the study area (two records to the southwest of the study area and several records surrounding the Nepean River) and within the surrounding locality (1,167 records within 10 kilometres of the study area). Koala was recorded from the presence of scats located in vegetation adjacent to the study area during habitat assessments conducted in August 2022. The western and southern extent of the study area is mapped as priority conservation land and Koala habitat under the CPCP and provides a connective corridor throughout the landscape, along the Nepean River.

The proposed works would result in the clearing of up to 10.07 hectares of Koala habitat, described as PCT 849 and PCT 1395 containing canopy which includes known Koala feed tree species. As impacts are expected to Koala habitat, an assessment of impacts against the Significant Impact Criteria for Matter of National Environmental Significance is required.

SIC assessment for Koala
Lead to the long-term decrease in the size of a population.
The Koala within NSW occurs from the Queensland border through to the border with Victoria. Vegetation within the study area associated with the Nepean River is mapped under the CPCP (DPE 2022a) as a Koala habitat corridor and priority conservation land. For the purpose of this assessment the local population of koalas are assumed to include all koalas which occur within the southern Sydney Koala Population (Campbelltown and Wollondilly LGAs) as identified in the CPCP Sub-plan B: Koalas (DPE 2022i). Importantly the southern Sydney Koala Population would also be considered to constitute an important population, as the area is known to have a high level of occupancy for the koala (DSEWPC 2012). The proposed works would result in the removal of up to 10.06 ha of habitat, comprised of linear strips of vegetation along the northern and southern edge of Picton Road and the eastern and western sides of the M31 Hume Motorway. The vegetation to be removed is well connected to larger patches of remnant vegetation within protected lands including the Bargo State Conservation Area and Nattai National Park to the South-east, which are in turn connected through to the Blue Mountains National Park. The study area is also well connected towards the east to the Upper Nepean State Conservation Area and vegetation associated with the Illawarra Escarpment including through to Heathcote National Park in the north-east. Although Picton Road and the M31 Hume Motorway provide a fatality risk for dispersing Koala, connectivity to large patches of high-quality remnant vegetation throughout the study area is relatively high, particularly through areas which occur near the Nepean River. Given the connectivity within the landscape and small scale of linear impacts proposed, vegetation to be impacted by the proposed works is considered unlikely to be of high importance to the Koala such that loss of this vegetation would result in a long-term decrease to the size of the Koala population. The removal of up to 10.06 ha of vegetation along a linear corridor is therefore considered unlikely to lead to a long-term decrease in the size of the population on a local and broader regional scale, as it would not limit Koala movement throughout the broader locality, or significantly reduce the availability of foraging resources.
Reduce the area of occupancy of the species.
The removal of up to 10.06 ha of vegetation along the edge of Picton Road and the M31 Hume Motorway likely provides some marginal foraging and breeding habitat for the Koala, as it contains a variety of known Koala feed tree including Grey gums, Forest Red Gums, Broad-leaf Ironbark and Narrow-leaf Ironbark. This vegetation is adjacent to two high speed roads (the M31 Hume Motorway at 110km/h and Picton Road between 80-100km/h). Vegetation to be removed is connected to a larger patch of high-quality habitat throughout the Nepean River and riparian corridors associated with smaller waterways throughout the study area. Removal of the linear area of vegetation would not reduce connectivity throughout the landscape such that Koala would be unable to move through the Nepean River corridor, or across existing cleared paddock areas. Koala protection measures currently being implemented include exclusion fencing along the M31 Hume Motorway and Picton Road to prevent Koala mortality and encourage movement through safe crossings underneath the Pheasants Nest Bridge at the south end of the study area and the bridge over the Nepean River, on Picton Road in the west. In addition, although the total area to be removed by the proposed works comprises 10.06 ha, this is spread over a linear corridor along the north and south of Picton Road, and east and west of the M31 Hume Motorway and comprises a small part of the overall available habitat in the locality.

SIC assessment for Koala
The removal of up to 10.06 ha of vegetation along the road verge within an area of high connectivity is therefore considered unlikely to significantly reduce the area of occupancy for the Koala. The species will continue to forage and breed in retained habitat outside of the proposal site.
Fragment an existing population into two or more populations.
As major roadways, Picton Road and the M31 Hume Motorway likely represent a significant fatality risk for Koalas dispersing within the local area. Connective vegetated corridors under the roadways, where Picton Road and the M31 Hume Motorway bridge the Nepean River, facilitate Koala dispersal throughout the locality. Vegetation below the bridges, along the Nepean River would not be removed because of the proposed works, and minor removal of vegetation adjacent to the roadways (above the edge of the cliff line) is unlikely to reduce the width of the vegetated corridor such that Koala movement would be impeded. These areas would be subject to minor disturbance from the proposed works. The function of the connective corridors within and adjacent to the study area is not likely to be impacted by this scale of vegetation removal and therefore the proposed works would be unlikely to fragment or to isolate the existing population.
Adversely affect habitat critical to the survival of a species.
The proposal would impact 10.06 ha of PCT 1395, PCT 1185 and PCT 849 which contains several feed tree species (Grey Gum, Red Gum, Broad-leaf Ironbark, Narrow-leaf Ironbark) forming Koala habitat. Under the *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (DCCEEW 2022c), habitat critical to the survival of the species is defined as the areas that the species relies on to avoid or halt decline and promote the recovery of the species. As such habitat critical to the survival of the Koala would include the following: • Habitat that is utilised during periods of stress (flood, drought, or fire). • Habitat that is important to maintain genetic diversity. • Habitat that is used to meet essential life cycle requirement including foraging and breeding. • Habitat that provides necessary corridors to allow the species to move freely between sites used to meet essential life cycle requirements. • Habitat that is necessary to ensure the long-term future of the species. Clearing because of the proposed works would result in the removal of up to 10.06 ha of Koala habitat along the roadside of Picton Road and the M31 Hume Motorway. Habitat within the broader locality and adjacent to the proposed works would likely form habitat considered critical to the survival of the species as it is likely utilised by breeding individuals, during dispersing and periods of stress. However, the small scale of the proposed works, spread across a linear proposal site and comprised of vegetation occurring at the edge of existing infrastructure is unlikely to be critical such that removal of the vegetation would adversely affect the survival of the species.
Disrupt the breeding cycle of a population.
The species was detected during survey within vegetation to the north of Picton Road, towards the west end of the alignment. While records indicate the species is present in the locality, individuals are likely to utilise the linear, edge affected study area vegetation infrequently as part of a wider home range and the habitat to be impacted is unlikely to be solely relied upon by individuals in the area. The proposed works are not expected to fragment the population and therefore is not expected to impact genetic diversity of individuals within the locality. While the proposal may result in the removal of vegetation utilised by Koala as part of a wider home range, it is unlikely to result in the disruption to the breeding cycle of the local population. It is also considered unlikely that disturbance from noise or lighting associated with short term impacts from construction would substantially interfere with the species' ability to reproduce in the locality given the high level of noise, vibration, and light disturbance from the existing roads.

SIC assessment for Koala
Important populations for Koala have not been defined due to lack of sufficient information to adequately identify and separate the nature of important populations throughout the range of the species (DoE 2014b).
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Koalas are assumed to utilise the study area on occasion. Impacts to a linear area totaling 10.06 ha of Koala habitat within the road reserve would reduce the overall resources within the immediate locality. However, given the contiguous nature of adjacent native vegetation with a large tract of good quality bushland containing Koala feed trees, the impact is not considered substantial enough to impact the quality or availability of habitat such that the species is likely to decline. The proposed works would not isolate populations as the development would not substantially decrease the width of movement corridors and thus is not likely to constitute a barrier to movement and unlikely to result in the decline of the species as a whole.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.
The study area is connected to native vegetation, cleared paddocks and semi-urban development where a number of feral animals and predators are likely to be established. Some of these are known to negatively impact Koalas including dogs and foxes. However, the proposed works would improve existing roads and it is unlikely that the proposed would result in the establishment of new invasive species. Mitigation measures to prevent the spread of weeds and pathogens will be implemented during construction and the proposed works are therefore unlikely to exacerbate the current level of invasive species within the area.
Introduce disease that may cause the species to decline.
The proposed works are unlikely to result in the introduction of a disease (e.g., Chlamydia) that could reduce the reproductive output of Koala populations in or near the proposed works area. Mitigation measures to prevent the spread of pathogens within soil and weed seeds will be implemented as part of environmental construction controls.
Interfere substantially with the recovery of the species.
The approved conservation advice (DCCEEW 2022c) gives priority to the following conservation actions: • Develop and implement a development planning protocol to be used in areas of Koala populations to prevent loss of important habitat, Koala populations or connectivity options. • Development plans should explicitly address ways to mitigate risk of vehicle strike when development occurs adjacent to, or within, Koala habitat. • Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary. • Identify populations of high conservation priority. • Investigate formal conservation arrangements, management agreements and covenants on private land, and for Crown and private land investigate and/or secure inclusion in reserve tenure if possible. • Manage any other known, potential, or emerging threats such a Bell Miner Associated Dieback or Myrtle Rust. • Develop and implement options of vegetation recovery and re-connection in regions containing fragmented Koala populations, including inland regions in which Koala populations were diminished by drought and coastal regions where development pressures have isolated Koala populations. • Develop and implement a management plan to control the adverse impacts of predation on Koalas by dogs in urban, peri-urban, and rural environments.

SIC assessment for Koala
• Engage with private landholders and land managers responsible for the land on which populations occur and encourage these key stakeholders to contribute to the implementation of conservation management actions.
The proposed works are not likely to result in increased dog attacks, which are primarily an issue where new urban development encroaches upon Koala habitat. While the proposed works can be expected to result in an increase in traffic in some areas during the construction phase, this would be temporary and would not result in sustained increases in Koala road-related mortalities. Installation of exclusion fencing along sections of Picton Road and the M31 Hume Motorway is currently being progressed and will assist in ensuring Koalas are funneled to bridge areas where these roads cross the Nepean River, where safe crossing can be made.
The proposed works are unlikely to result in the introduction of a disease (e.g., Chlamydia) that could reduce the reproductive output of Koala populations in or near the proposed works area. Similarly, the proposed works are unlikely to exacerbate the current level of invasive species threat operating within the proposed works area. Machinery wash-down will prevent the spread of pathogens such as Phytophthora, a soil borne water mould that produces an infection which causes root rot in plants. This will limit the impact to Koala feed tree species in the area. The proposal would not result in an increased barrier to the movement of Koalas between habitat patches and therefore would not further restrict the species' ability to disperse or carry out normal demographic processes.
The proposed works are not expected to result in substantial changes to hydrology that would result in degradation of any critical habitat to the extent that the carrying capacity of that habitat is reduced.
While the proposed works would result in a reduction of Koala habitat in the locality, it is unlikely the proposed impacts would significantly reduce the overall available habitat for the local population, individuals, and the species due to the scale, location and current level of disturbance associated with this vegetation to be removed.
The proposed works are therefore unlikely to substantially interfere with the recovery of Koala in the locality.
Conclusion.
In consideration of the above significant impact criteria, the proposed woks are not likely to significantly impact Koalas, as: • The proposed works would result in impacts to 10.06 ha of Koala foraging and dispersal habitat. Given the availability of similar resources within the locality, impacts to these trees is not considered to constitute a significant impact. • The proposed works are unlikely to reduce connectivity in the area, or limit species movement such that an existing population becomes fragmented in two or more populations. • The proposed works are unlikely to result in the introduction of a disease (e.g., Chlamydia) that could reduce the reproductive output of the Koala populations in or near the proposed works area. • The proposed works do not substantially contribute to a KTP for Koala or impact upon any of the priority conservation actions for the species. This assessment has determined that a referral to the minister is not recommended.

Appendix E: Biodiversity credit report

BAM Credit Summary Report

Proposal Details

Assessment Id
00032462/BAAS17067/22/00032463

Proposal Name
Picton Road

BAM data last updated *
22/06/2023

Assessor Name
Rebecca E. Dwyer

Report Created
18/10/2023

BAM Data version *
61

Assessor Number
BAAS17067

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
17

Assessment Type
Part 5 Activities

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

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Cumberland shale - sandstone Ironbark forest												
5	1395_DNS	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	4.9	4.9	0.04	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0

6	1395_High	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	80.4	80.4	0.05	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	3
7	1395_Low	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	58.3	58.3	4.2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	153
8	1395_Moderate	Shale Sandstone Transition Forest in the Sydney Basin Bioregion	69.3	69.3	1.4	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	59
											Subtotal	**215**
Cumberland shale plains woodland												
1	849_DNG	Cumberland Plain Woodland in the Sydney Basin Bioregion	28.3	28.3	0.45	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	8
2	849_DNS	Cumberland Plain Woodland in the Sydney Basin Bioregion	24.8	24.8	0.39	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	6
3	849_Moderate	Cumberland Plain Woodland in the Sydney Basin Bioregion	58.3	58.3	2.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	101

4	849_Scattered_trees	Cumberland Plain Woodland in the Sydney Basin Bioregion	2.5	2.5	0.02	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Critically Endangered Ecological Community	Not Listed	2.50	True	0
											Subtotal	**115**
											Total	**330**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Chalinolobus dwyeri / Large-eared Pied Bat (Fauna)									
1395_Low	58.3	58.3	4.2			Vulnerable	Vulnerable	True	183
1395_Moderate	69.3	69.3	1.4			Vulnerable	Vulnerable	True	71
849_Moderate	58.3	58.3	2.7			Vulnerable	Vulnerable	True	116
1395_High	80.4	80.4	0.05			Vulnerable	Vulnerable	True	3
849_Scattered_trees	2.5	2.5	0.02			Vulnerable	Vulnerable	True	1
								Subtotal	**374**
Myotis macropus / Southern Myotis (Fauna)									
1395_Low	58.3	58.3	4.1			Vulnerable	Not Listed	False	120
1395_Moderate	69.3	69.3	1.4			Vulnerable	Not Listed	False	47
849_Moderate	58.3	58.3	2.3			Vulnerable	Not Listed	False	67
1395_High	80.4	80.4	0.05			Vulnerable	Not Listed	False	2

849_Scattered_trees	2.5	2.5	0.01			Vulnerable	Not Listed	False	1
								Subtotal	**237**
Phascolarctos cinereus / Koala (Fauna)									
1395_Low	58.3	58.3	4.1			Endangered	Endangered	False	120
1395_Moderate	69.3	69.3	1.4			Endangered	Endangered	False	47
849_Moderate	58.3	58.3	2			Endangered	Endangered	False	58
1395_High	80.4	80.4	0.05			Endangered	Endangered	False	2
849_Scattered_trees	2.5	2.5	0.02			Endangered	Endangered	False	1
								Subtotal	**228**

Appendix F: Recommended species planting list

Recommended species planting list for PCT 1395

Botanical name	Common name
Trees	
Eucalyptus crebra	Narrow-leaved Ironbark
Eucalyptus eugenioides	Narrow-leaved Stringy Bark
Eucalyptus fibrosa	Broad-leaved Ironbark
Eucalyptus punctata	Grey Gum
Eucalyptus tereticornis	Forest Red Gum
Small trees and shrubs	
Acacia decurrens	Black Wattle
Acacia parramattensis	Parramatta Wattle
Allocasuarina littoralis	Black She-oak
Breynia oblongifolia	Coffee Bush
Bursaria spinosa	Native Blackthorn
Daviesia ulicifolia	Gorse Bitter-pea
Dodonaea triquetra	Common Hop Bush
Indigofera australis	Australian indigo
Kunzea ambigua	Tick Bush
Leptospermum trinervium	Slender Tea-tree
Ozothamnus diosmifolius	White Dogwood
Forbs, herbs and ground covers	
Centella asiatica	Indian Pennywort
Commelina cyanea	Native Wandering Jew
Dichondra repens	Kidney Weed
Einadia nutans	Climbing Saltbush
Lobelia purpurascens	White Root
Lomandra multiflora subsp. Multiflora	Many-flowered Matt-rush
Solanum prinophyllum	Forest Nightshade
Climbers and scramblers	
Glycine clandestina	Twining Glycine
Hardenbergia violacea	Sweet Sarsparilla
Grasses	
Entolasia marginata	Bordered Panic
Imperata cylindrica var. *major*	Blady Grass
Microlaena stipoides var. *stipoides*	Weeping Grass
Themeda triandra	Kangaroo Grass

Recommended species planting list for PCT 849

Botanical name	Common name
Trees	
Acacia decurrens	Black Wattle
Acacia implexa	Hickory Wattle
Eucalyptus eugenioides	Thin-leaved Stringybark
Eucalyptus moluccana	Grey Box
Eucalyptus tereticornis	Forest Red Gum
Melaleuca decora	White Feather Honey-myrtle
Shrubs	
Bursaria spinosa	Native Blackthorn
Dodonaea viscosa	Sticky Hop-bush
Indigofera australis	Australian Indigo
Forbs, herbs and ground covers	
Brunoniella australis	Blue Trumpet
Clematis aristata	Old Man's Beard
Dichondra repens	Kidney Weed
Geranium solanderi	Native Geranium
Goodenia hederacea	Ivy Goodenia
Climbers and scramblers	
Hardenbergia violacea	False Sarsaparilla
Glycine clandestina	Twining glycine
Sedges, rushes and grasses	
Aristida vagans	Threeawn Speargrass
Bolboschoenus fluviatilis	Marsh Club-rush
Bothriochloa macra	Red Grass
Carex appressa	Tall Sedge
Chloris ventricosa	Plump windmill grass
Dianella longifolia	Blueberry Lily
Imperata cylindrica var. *major*	Blady Grass
Juncus usitatus	Common Rush
Lomandra multiflora subsp. *multiflora*	Many-flowered Mat-rush
Microlaena stipoides	Weeping Grass
Poa labillardierei var. *labillardierei*	Tussock Grass
Rytidosperma caespitosum	Ringed Wallaby Grass
Themeda triandra	Kangaroo Grass

Recommended species planting list for PCT 1181

Botanical name	Common name
Trees	
Angophora costata	Sydney Red Gum
Corymbia gummifera	Red Bloodwood
Eucalyptus piperita	Sydney Peppermint
Eucalyptus punctata	Grey Gum
Eucalyptus pilularis	Blackbutt
Syncarpia glomulifera	Turpentine
Small trees and shrubs	
Allocasuarina littoralis	Black She-oak
Persoonia linearis	Narrow-leaved Geebung
Persoonia levis	Broad-leaved Geebung
Banksia spinulosa	Hairpin Banksia
Acacia ulicifolia	Prickly moses
Acacia terminalis	Sunshine Wattle
Banksia serrata	Old man Banksia
Leptospermum trinervium	Slender Tea-tree
Forbs, herbs and ground covers	
Phyllanthus hirtellus	Thyme Spurge
Pomax umbellata	Pomax
Dichondra repens	Kidney Weed
Einadia nutans	Climbing Saltbush
Solanum prinophyllum	Forest Nightshade
Climbers and scramblers	
Smilax glyciphylla	-
Grasses/sedges	
Entolasia marginata	Bordered Panic
Entolasia stricta	Wiry Panic
Microlaena stipoides var. *stipoides*	Weeping Grass
Lomandra longifolia	Spiny-headed Matt-Rush
Lomandra obliqua	-
Lepidosperma laterale	Variable Sword-sedge
Dianella caerulea	Blue Flax-lily

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