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APPENDIX J – Environmental Impact Statement

Biodiversity development assessment report

Prepared for Lake Lyell Project Pty Ltd



Lake Lyell Pumped Hydro Energy Storage

Biodiversity development assessment report

Lake Lyell Project Pty Ltd

E221111 RP27

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Executive Summary

ES1 Project description

EnergyAustralia Portfolio Holdings Pty Ltd (EnergyAustralia) in partnership with EDF power solutions Australia (EDFA), referred to as Lake Lyell Project Pty Ltd (LLP) as trustee, is developing the Lake Lyell Pumped Hydro Energy Storage (PHES) Project (the project). The project will have the capacity to store up to 3,080 megawatt hours (MWh) of energy and generate at 385 megawatts (MW) for 8 hours or generate up to around 440 MW for a shorter period. At a basic level, it will consist of upper and lower water reservoirs, a pipeline connecting them, and a hydro-electric power station connected to the national energy grid that is capable of generating or consuming electricity.

The project is located approximately 5 kilometres (km) west of Lithgow and 110 km west of the Sydney central business district. The project takes advantage of existing infrastructure (i.e. Lake Lyell) associated with Mt Piper power station which will be decommissioned in the coming decades and allows Lake Lyell to continue to serve a specific purpose in electricity generation (consistent with its existing use).

A construction envelope has been developed for the project which represents the maximum extent of where disturbance may occur during all activities associated with the construction and operation of the project. The variation in the extent of the construction envelope reflects the confidence around the placement of design elements and the likelihood that some minor amendments may be required prior to commencing the construction works as a result of the detailed design. The construction envelope for the project covers an area of around 197 hectares (ha). Located entirely within the bounds of the construction envelope sits the disturbance footprint, a smaller area that has been derived directly from the current level of design. The disturbance footprint represents the physical disturbance that can be expected as part of the construction works and covers an area of up to 137 ha for the project with preferred Lakeside camp or to 146 ha for the project with alternative Town camp. As the design is refined, the final siting of the disturbance footprint can move within the construction envelope, subject to the recommended environmental management measures, and revision of offset requirements.

The design of the project has been prepared with the goal of minimising the impacts associated with the development and operation of a pumped hydro scheme. The use of Lake Lyell as a lower reservoir will negate the need for a lower reservoir to be built. The proximity of the project area to existing electricity infrastructure also lessens the need for additional transmission infrastructure.

The project has been declared by the NSW Government to be critical State significant infrastructure (CSSI) under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This biodiversity development assessment report (BDAR) is an appendix to the project's environmental impact statement (EIS) and should be read in conjunction with the main EIS. This BDAR was prepared in accordance with the Biodiversity Assessment Method (BAM 2020). It includes the terrestrial biodiversity assessment methods and results, the initiatives built into the project design to avoid and minimise associated impacts to terrestrial biodiversity, and the mitigation, and management measures, including offset requirements, proposed to address any unavoidable residual impacts. This document also provides a strategy to offset the residual impacts of the project.

ES2 Landscape features

The project is almost entirely located within the NSW South Eastern Highlands Interim Biogeographic Regionalisation of Australia (IBRA) bioregion and crosses the Hill End and Bathurst IBRA subregions. The alterative town accommodation camp site is located in the Sydney Basin IBRA bioregion, mostly within the Burragorang IBRA subregion and partly within the Wollemi IBRA subregion.

The project is mostly located on the Mount Horrible Plateau and Bathurst Granites BioNet NSW Landscapes (formerly Mitchell Landscapes), with a small area within the Sydney Basin Western Escarpment landscape.

The PHES area and adjacent parts of the access road are located within the Hill End IBRA subregion and Mount Horrible Plateau landscape. The eastern part of the access road is located in the Bathurst IBRA subregion and the Bathurst Granites and Sydney Basin Western Escarpment landscape landscapes.

The PHES part of the project area is bordered by Marrangaroo National Park to the north and incorporates the southern flank of Mount Walker. The project area also encompasses the artificial waterbody reservoir of Lake Lyell and various connected streams, including sections of the Coxs River and Farmers Creek.

The project area is characterised by moderately to steeply sloped hillsides and gullies, with gentler slopes in ridgetop areas and foot-slopes around the shores of the reservoir. It ranges in altitude from approximately 780 metres (m) to approximately 1,140 m above sea level. While most of the PHES part of the project area is covered in native woodland and forest, small areas, predominantly restricted to the fringes of Lake Lyell, have been cleared previously for agricultural and other purposes. The accommodation camps and access roads are in a landscape that has largely been cleared of native vegetation for agriculture, infrastructure and residential development.

Within and surrounding the construction envelope, vegetation cover was estimated at approximately 73% for the Hill End IBRA subregion, 29% for the Bathurst IBRA subregion, and 46% for the Burragorang and Wollemi IBRA subregions based on regional vegetation mapping and aerial imagery. The patch sizes of all vegetation zones were calculated to be greater than 100 ha due to the contiguity of vegetation in the construction envelope with nearby remnant vegetation.

ES3 Native vegetation

Native vegetation within the PHES area of the construction envelope is generally structurally intact but some areas have a simplified vegetation structure and considerable weed invasion due to past land use, including historical timber felling, road construction and livestock grazing. Vegetation in access road and accommodation camp areas varies from relatively intact roadside forest remnants to areas of highly disturbed grassland growing on fill material.

There is no evidence of recent bushfire in the construction envelope and the paucity of charring on trees suggests that the area has not been burnt in several decades. Notably, despite part of the 2020/2021 Gospers Mountain bushfire having affected vegetation nearby, the vegetation in the construction envelope was not affected, so recent fire did not affect the vegetation assessment.

Dry sclerophyll forests and grassy woodlands occur over most of the construction envelope with smaller areas of wet sclerophyll forest in some protected gullies in higher elevation areas.

Ten plant community types (PCTs) were mapped within the construction envelope:

- PCT 3211 – Central Tableland Montane Wet Forest
- PCT 3347 – Southern Tableland Creekflat Ribbon Gum Forest
- PCT 3348 – Southern Tableland Granites Ribbon Gum Grassy Forest
- PCT 3367 – Central Tableland Granites Grassy Box Woodland
- PCT 3369 – Central Tableland Ranges Peppermint-Gum Grassy Forest
- PCT 3385 – Southern Tableland Creekflat Swamp Woodland
- PCT 3650– Goulburn-Lithgow Ranges Silvertop Ash Forest

- PCT 3687– Newnes Plateau Peppermint-Ash Tall Forest
- PCT 3735 – Central Tableland Peppermint Shrub-Grass Forest
- PCT 3747 – Southern Tableland Western Hills Scribbly Gum Forest.

Vegetation zones were delineated by the level of disturbance of the canopy and condition of understorey vegetation, particularly regarding the abundance of weeds and ground disturbance. Eighteen vegetation zones were delineated across the ten PCTs.

No threatened ecological communities (TECs) occur within the construction envelope.

ES4 Groundwater dependent ecosystems

No significant impacts on groundwater dependent ecosystems are predicted to occur as a result of the project. A separate report covering groundwater dependent ecosystem (GDE) assessment (EMM, 2025a) is appended to the EIS.

ES5 Threatened species

Habitat for threatened animals within the project is generally structurally intact and of high quality, given the high density of mature and hollow-bearing trees, rocky areas and fallen timber. But in some areas, particularly around the southern foreshores of Lake Lyell and along the access road, historical tree felling has resulted in simplification of habitat, with a relatively low density of hollows remaining for hollow-associated fauna.

A habitat assessment within the construction envelope was used to guide the candidate species assessment.

The following species-credit species were recorded:

- Koala (*Phascolarctos cinereus*); scats found in one location in the PHES area
- Powerful Owl (*Ninox strenua*); recorded in several locations in the PHES area and potential nesting habitat present
- Sooty Owl (*Tyto tenebricosa*); recorded in several locations in the PHES area and potential nesting habitat present
- Southern Myotis (*Myotis macropus*); recorded in several locations around Lake Lyell with a possible recording in a single location adjacent to Sir Thomas Mitchell Drive.

Breeding activity (generating species credits) and foraging activity was observed for the following dual-credit (ecosystem-credit and species-credit) animal species within the construction envelope:

- Gang Gang Cockatoo (*Callocephalon fimbriatum*)
- Glossy Black-Cockatoo (*Calyptorhynchus lathami lathami*).

No evidence of breeding activity was apparent for the following dual-credit species which were recorded in the construction envelope:

- White-bellied Sea-eagle (*Haliaeetus leucogaster*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*).

The following ecosystem species were recorded opportunistically within the construction envelope:

- Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*)
- Scarlet Robin (*Petroica boodang*)
- Varied Sittella (*Daphoenositta chrysoptera*)
- Dusky Woodswallow (*Artamus cyanopterus cyanopterus*).

Although not detected in the construction envelope during targeted surveys, the Purple Copper Butterfly (*Paralucia spinifera*) was recorded opportunistically approximately 300 m outside of the construction envelope in a recently disturbed power transmission easement. The species was assumed to be present within some parts of the construction envelope that were not able to be adequately surveyed due to a lack of suitable environmental conditions at the times of planned surveys. This approach was taken as the population density and detectability of the species is strongly influenced by site disturbance history. The species exhibits great variation both in its 'apparent' presence or absence and its actual numbers from year to year at each site (NSW TSSC 2024). Without new growth of the food plant (*Bursaria spinosa*) promoted by post-disturbance conditions, the mature plants often become temporarily less suitable as habitat, reducing butterfly populations to the extent that they are extremely difficult to detect. Due to a lack of recent disturbance in most of the construction envelope, it is likely that the species would be very difficult to detect there, even if it forms part of the range of the population of the species which occurs in the adjacent Marrangaroo National Park. For this reason, the species was assumed to be present in areas of the construction envelope with a moderate to high density of the larval food plant that have not received any recent disturbance.

ES6 Aquatic and riparian biodiversity

Impacts to aquatic biodiversity values are addressed in a separate assessment (Austral Research and Consulting 2025) which is appended to the EIS at Appendix K. Nonetheless the BDAR considers and addresses prescribed impacts in relation to water quality. A separate report covering surface water quality assessment (EMM, 2025e) is appended to the EIS. The project may have both positive and negative impacts on habitat for threatened species as discussed in detail in Section 8.1.3v.

ES7 Impact avoidance, minimisation and mitigation

A key focus of the project has been to avoid and minimise impacts to biodiversity values identified during the field surveys. The project has undergone significant steps to avoid, minimise and mitigate impacts to ensure impacts are avoided and minimised to the greatest extent possible, within the design and other limitations of the project.

Avoidance consideration of options and development of the project was informed by iterative environmental constraint assessments comprising both desktop and field survey. The project was designed to avoid, where practical direct impacts to threatened flora species and critical habitat known to support threatened fauna species.

Clearing of large extents of native vegetation and associated habitat has been substantially avoided through siting the project in an area containing existing infrastructure that can be utilised by the project in the form of the existing artificial water storage in Lake Lyell, existing 330 kilovolt (kV) transmission lines which pass over the project area and the existing road network. Reducing the construction footprint by utilising existing infrastructure will also reduce potential indirect (e.g. noise, light and dust) and prescribed (e.g. vehicle strike) impacts associated with construction.

Key biodiversity constraints identified early on in project design which guided the project design to avoid / minimise impacts include:

- Marrangaroo National Park – project will avoid direct impacts and minimise indirect impacts by siting the construction envelope at least 20 m away from the boundary of this National Park
- Farmers Creek – project will avoid impacts to the natural system of Farmers Creek by diverting entrant flows within the lake below the junction of the creek and Lake Lyell, rather than higher up in the catchment.

Minimisation and mitigation of impacts was also incorporated into development of the design and associated disturbance footprint whereby the extent of vegetation and habitat disturbance was reduced, particularly in more sensitive areas such as known and potential breeding habitat for threatened owls and cockatoos.

The principles to avoid and minimise impacts will continue to inform the refinement and optimisation of the project during detailed design.

All works will be undertaken in accordance with general mitigation measures to be identified in the construction environment management plan (CEMP).

A summary of measures undertaken to avoid, minimise and mitigate impacts is provided in Section 8.3.

ES8 Impact assessment

The project will result in the following direct impacts:

- loss of approximately 102.04 ha of native vegetation and threatened species habitat with a vegetation integrity (VI) score of greater than 20, which generates a biodiversity offset requirement
- loss of approximately 27.70 ha of vegetation with a VI score of less than 20 that is not considered to be threatened species habitat, and does not generate a biodiversity offset requirement
- loss of 11 trees with hollows that are known or strongly suspected to be utilised by Gang-gang Cockatoos for breeding and loss of up to approximately 568 other trees with hollows of approximately 7 centimetres (cm) or larger entrance diameter, many of which may have potential to be utilised for nesting
- loss of approximately 294 trees with hollows of approximately 20 cm or larger entrance diameter, many of which may have potential to be utilised by Powerful Owls or Sooty Owls for nesting
- loss of potential breeding habitat for the Glossy Black Cockatoo, likely to be utilised by a breeding pair
- loss of approximately 3.62 ha of high-quality foraging habitat for the Glossy Black Cockatoo.

Two serious and irreversible impacts (SAII) candidate species were recorded within the construction envelope, the Sooty Owl and Large Bent-winged Bat. Two other SAII candidate species, the Swift Parrot and Regent Honeyeater are assumed to occur in suitable habitat in the construction envelope. These species are only considered to be at risk of SAII if particular important habitat types are impacted. No habitats associated with SAII for these species (mapped important habitat or cave habitat) are found in or adjacent to the construction envelope.

No other SAII entities are likely to be impacted by the project.

Three prescribed impacts are expected to occur as a result of the project. These potential prescribed impacts are:

- interruption of animal movement corridors
- water quality and waterway health

- vehicle strikes.

Mitigation measures to minimise these prescribed impacts on threatened species have been included in this assessment.

ES9 Impacts to National parks estate

Marrangaroo National Park is located approximately 20 metres from the north-west boundary of the construction envelope.

The construction envelope location eliminates the potential for the project to result in surface water runoff into the national park as the construction envelope is situated down slope and separated by a crown road from the boundary of the National park.

The area of the construction envelope adjacent to the national park has historically been affected by partial clearing for vehicle tracks, erosion and weed invasion from land use activities and is affected by ongoing feral animal activity, particularly pig activity.

There is some potential for the project to disperse weeds species into areas where they do not currently occur due to increased vehicle movements. However, this would be mitigated through the site hygiene and weed management proposed, which would also address the existing risks associated with recreational vehicles.

Native vegetation may be affected by changes to microclimatic conditions such as sunlight levels, average windspeed and soil moisture availability but it is not likely to be significantly impacted.

No access to the project would be permitted through the National park during construction or operation of the project (other than in the event of an emergency). As the internal access roads would be secure and not publicly accessible, no additional unauthorised access to the National park would result from the project.

The wastewater services and asset protection zones associated with the project would not impact the National park.

Noise, vibration and artificial lighting may lead to some animals temporarily ceasing to utilise habitat within areas of the National park immediately adjacent to the disturbance footprint during the construction of the project or may impair their normal activities. However, it is unlikely to cause a significant impact on any species as the boundary is on a sharp ridgeline which provides a topographic barrier and will screen noise, vibration and lighting from encroaching far beyond the boundary of the National park.

The project would have negligible impact on GDEs known or likely to occur within the National park (EMM, 2025a).

No other indirect impacts on biodiversity values of Marrangaroo National Park, as discussed in the 'Developments adjacent to National Parks and Wildlife Service lands' guideline (DPIE, 2020), are likely to occur due to the project.

ES10 Cumulative impacts

Cumulative impacts on biodiversity values are expected to occur due to the Lake Lyell PHES project in combination with nearby future projects. The Gang-gang Cockatoo, Glossy Black Cockatoo, Koala, Powerful Owl and Purple Copper Butterfly were identified as key threatened species for cumulative impact assessment (CIA). That is, the combined impact of the project with relevant nearby projects that are anticipated to have future impacts on biodiversity values. The cumulative area of impact constitutes a small proportion of potentially suitable habitat for these species in the CIA study area which included a 20 km radius of the construction envelope. Large extents of remnant habitat are protected in this CIA study area in Marrangaroo National Park and Gardens of Stone State Conservation Area. The cumulative impact of future projects in the CIA study area (should they all be constructed) is expected to lead to the loss of approximately 0.25% of potential habitat available for the key threatened species.

The potential cumulative impact of the project and nearby future projects are also not expected to considerably impact habitat connectivity for the five key threatened species. That is, there were no future projects identified, which in combination with the project, would inhibit movement of any of the five key threatened species.

ES11 Biodiversity offsets

The project requires a total of 3,989 ecosystem credits to compensate for impact on native vegetation and associated ecosystem credit species habitat. An additional 18,115 species credits are required to offset the residual impacts of the project on species credit species that were recorded or assumed present within the construction envelope.

Ecosystem credits required are:

- PCT 3211 - Central Tableland Montane Wet Forest - 209 credits
- PCT 3348 - Southern Tableland Granites Ribbon Gum Grassy Forest - 119 credits
- PCT 3367 - Central Tableland Granites Grassy Box Woodland - 496 credits
- PCT 3369 - Central Tableland Ranges Peppermint-Gum Grassy Forest – 1,112 credits
- PCT 3385 - Southern Tableland Creekflat Swamp Woodland- 11 credits
- PCT 3650 - Goulburn-Lithgow Ranges Silvertop Ash Forest - 269 credits
- PCT 3687 - Newnes Plateau Peppermint-Ash Tall Forest- 2 credits
- PCT 3735 - Central Tableland Peppermint Shrub-Grass Forest – 1,459 credits
- PCT 3747 - Southern Tableland Western Hills Scribbly Gum Forest - 312 credits.

Species credits required are:

- Gang-gang Cockatoo -2,329 credits
- Glossy Black Cockatoo – 200 credits
- Purple Copper Butterfly (Bathurst Copper Butterfly) - 405 credits
- Powerful Owl – 4,053 credits
- Sooty Owl – 5,292 credits
- Southern Myotis – 1,314 credits
- Koala – 4,522 credits.

Offsets are not required for eight vegetation zones in poor condition states as the vegetation integrity score of these zones falls below the offset threshold under the BAM. Vegetation zones that do not require credits include those in the following condition states:

- DEGH – Derived exotic grassland and/or herbfield
- Sedge – Derived sedgeland

- Exotic – Exotic woody vegetation
- DNG_Poor – Poor condition derived native grassland.

Other areas within the construction envelope that do not require offsets include pre-existing cleared access road / tracks and waterbodies with open water and no emergent vegetation.

ES12 Assessment of impacts under other relevant biodiversity legislation

ES12.1 Environment Protection and Biodiversity Conservation Act 1999

No TECs or plant species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) occur within the construction envelope.

Three animal species listed as threatened under the EPBC Act were recorded within the construction envelope:

- Gang-gang Cockatoo
- Glossy Black Cockatoo
- Koala.

The Purple Copper Butterfly was also recorded adjacent to the construction envelope, so potential habitat for this species was assumed to be present in the construction envelope.

The following animal species listed as threatened species under the EPBC Act, which are ecosystem credit or dual credit species under the BAM, were not recorded in the construction envelope but are assumed to occur:

- Regent Honeyeater
- Painted Honeyeater
- White-throated Needletail
- Swift Parrot
- Yellow-bellied Glider
- Superb Parrot
- Grey-headed Flying-fox
- Brown Treecreeper (south-eastern)
- Hooded Robin (south-eastern)
- Diamond Firetail
- Spotted-tail Quoll
- Southern Whiteface
- Sharp-tailed Sandpiper
- Curlew Sandpiper

- Latham's Snipe.

Seven listed migratory species under the EPBC Act are likely to occur, seasonally, infrequently or sporadically, including:

- Black-faced Monarch
- Fork-tailed Swift
- Latham's Snipe
- Rufous Fantail
- Satin Flycatcher
- Sharp-tailed Sandpiper
- White-throated Needletail.

Assessments of Significance for the above species were undertaken for the above threatened and migratory EPBC Act listed species in Section 13.1. These Assessments of Significance concluded that the project is likely to have a significant impact on the Gang-gang Cockatoo, Glossy Black Cockatoo and Koala. No other EPBC Act listed species are likely to be significantly impacted by the project.

ES12.2 Biosecurity Act 2015

Six priority weed species for the Central Tablelands region were recorded in the construction envelope.

Conservation areas, natural environments and primary production lands should be prioritised for the control and eradication of priority weeds and other exotic plant species. The biodiversity management plan for the project would directly address the control of these weed species.

ES13 Delivery of biodiversity offsets

Lake Lyell Project Pty Ltd (LLP) will pursue biodiversity offsets required for the project, with measures to be taken to meet the biodiversity credit liability being:

- establishment of Stewardship sites on EnergyAustralia-owned land. LLP has already undertaken preliminary investigation of potential credit generation from EnergyAustralia landholdings. It is expected that relevant credits can be generated for affected PCTs
- a credit shortfall is anticipated which will be addressed via the development of additional Stewardship sites and/or via the purchase of credits (or land) from local external landholders to meet the anticipated credit shortfall
- limited use of the NSW Government Biodiversity Conservation Fund (BCF).

The offset package will be staged to meet the offset liability for each stage of the project.

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1 Introduction

1.1 Background

EnergyAustralia Portfolio Holdings Pty Ltd (EnergyAustralia) in partnership with EDF power solutions Australia (EDFA), referred to as Lake Lyell Project Pty Ltd (LLP) as trustee, is developing the Lake Lyell Pumped Hydro Energy Storage (PHES) Project (the project). The project will have the capacity to store up to 3,080 megawatt hours (MWh) of energy and generate at 385 megawatts (MW) for 8 hours or generate up to around 440 MW for a shorter period. At a basic level, it will consist of upper and lower water reservoirs, a pipeline connecting them, and a hydro-electric power station connected to the national energy grid that is capable of generating or consuming electricity.

The project is located approximately 5 kilometres (km) west of Lithgow and 110 km west of the Sydney central business district, shown in Figure 1.1 and Figure 1.2. The project takes advantage of existing infrastructure (i.e. Lake Lyell) associated with Mt Piper power station which will be decommissioned in the coming decades and allows Lake Lyell to continue to serve a specific purpose in electricity generation (consistent with its existing use).

In June 2024, the Minister for Planning and Public Spaces declared the project to be critical State significant infrastructure (CSSI). Accordingly, approval for the project is required under Part 5, Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). This requires the preparation of an environmental impact statement (EIS) for the project in accordance with Secretary's environmental assessment requirements (SEARs) and the approval of the Minister. EMM Consulting Pty Limited (EMM) has been engaged by LLP to prepare the EIS.

This biodiversity development assessment report (BDAR) is an appendix to the project's EIS and should be read in conjunction with it. The BDAR addresses the SEARs issued for the project.

1.2 Assessment guidelines and requirements

This BDAR is an appendix to the project's EIS and should be read in conjunction with it. The BDAR documents the terrestrial biodiversity assessment methods and results, the initiatives built into the project design to avoid and minimise associated impacts to terrestrial biodiversity, and the mitigation, and management measures, including offset requirements, proposed to address any unavoidable residual impacts.

The specific objectives of this assessment are to:

- describe biodiversity values of the construction envelope and broader project area
- assess the likelihood of threatened species and communities (threatened biodiversity) listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that could occur in the disturbance footprint
- document the strategies implemented to avoid and/or minimise impacts of the project on threatened biodiversity
- assess residual threatened biodiversity impacts, after avoidance and minimisation strategies have been implemented
- provide environmental safeguards to mitigate impacts on threatened biodiversity during construction and operation
- describe the offsets and other compensatory measures that are appropriate for the project.

This BDAR has been prepared in accordance with the Biodiversity Assessment Method (BAM) (DPIE 2020a).

1.2.1 SEARs

This BDAR has been prepared in accordance with the requirements of the NSW Department of Planning, Housing and Infrastructure (DPHI) and relevant agencies, which are set out in the SEARs for the project, issued on 17 November 2025. The SEARs identify matters which must be addressed in the EIS. Individual requirements relevant to this BDAR and where they are addressed in this report are listed in Table 1.1.

Table 1.1 Relevant matters raised in SEARs

Terrestrial biodiversity and ecology requirements	Section where addressed
Key Matter – Biodiversity: • an assessment of the biodiversity impacts of the project on terrestrial, aquatic riparian and groundwater-dependent ecosystems (including listed threatened species and communities) and impacts to National parks and reserves (including Marrangaroo National Park), including an assessment of the biodiversity values and the likely biodiversity impacts of the project, in accordance the *Biodiversity Conservation Act 2016* (BC Act), the Biodiversity Assessment Method 2020 and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must: – be prepared using the approved BDAR template – document the application of the avoid, minimise and offset framework including assessing all direct, indirect and prescribed impacts in accordance with the BAM – assess the impacts associated with all ancillary infrastructure, including the transport route road upgrades – include an assessment for SAII in accordance with Section 9.1 of the BAM – an assessment of the likely impacts on listed aquatic threatened species, populations or ecological communities, scheduled under the *Fisheries Management Act 1994*, and a description of the measures to minimise and rehabilitate impacts, including impacts to Lake Lyell, Coxs River and Farmers Creek – a cumulative impact assessment of biodiversity values in the region from nearby developments – if an offset is required, details of any strategy to offset any residual impacts of the project in accordance with the BC Act.	Assessment of biodiversity impacts is addressed in Chapter 8, Sections 8.1 and 8.2. Description of the proposed regime for avoiding, minimising, managing and reporting on the biodiversity impacts addressed in Chapter 8, Sections 8.3. Assessment of aquatic biodiversity impacts is addressed in the Aquatic Ecology Assessment (Austral Research and Consulting 2025) – appended to the EIS. Assessment of ground water dependent ecosystems is addressed in the Groundwater Assessment (EMM, 2025a) appended to the EIS and summarised in Chapter 7 of this report. Assessment of impacts on National parks and reserves and world heritage areas is addressed in Section 14 of the EIS and Section 8.1.3 of this BDAR. Cumulative impacts assessed in Chapter 10.

Terrestrial biodiversity and ecology requirements	Section where addressed
Standard Environmental Assessment Requirements - Biodiversity 1. Biodiversity impacts related to the proposed [development/project] are to be assessed in accordance with section 7.9 of the *Biodiversity Conservation Act 2016* the Biodiversity Assessment Method 2020 and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), Biodiversity Conservation Regulation 2017 (s6.8) and Biodiversity Assessment Method 2020, unless the Department determines that the proposed development is not likely to have any significant impacts on biodiversity values. 2. The BDAR must apply the avoid, minimise, and offset framework; including assessing all direct, indirect, uncertain and prescribed impacts in accordance with the Biodiversity Assessment Method 2020. 3. The BDAR must include details of the measures proposed to address the offset obligation as follows: a) The total number and classes of biodiversity credits required to be retired for the development/project; b) The number and classes of like-for-like biodiversity credits proposed to be retired; c) The number and classes of biodiversity credits proposed to be retired in accordance with the variation rules; d) Any proposal to fund a biodiversity conservation action; e) Any proposal to conduct ecological rehabilitation (if a mining project); f) Any proposal to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits. 4. The BDAR must be submitted with all spatial data associated with the survey and assessment as per Appendix K of the BAM. **5.** The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the *Biodiversity Conservation Act 2016*.	1. Biodiversity impacts are addressed in Chapter 8, Sections 8.1 and 8.2. 2. Avoid, minimise, and offset framework - addressed in Chapter 8, Section 8.3. 3. Offset obligation - addressed in Chapter 12. 4. Spatial data – provided to CPHR as an electronic data package. 5. BDAR Accreditation - located in Chapter 1, Section 1.4.
Standard Environmental Assessment Requirements – Biodiversity (continued) **Residual Prescribed Impacts within the BAM 2020** Prescribed impacts can be difficult to quantify as they may result in discrete impacts, spatially undefined impacts, ecological regime shifts and/or impact cascades over time. Consequently, avoiding or minimising such impacts is critical and will likely be a key consideration for the consent authority in determining conditions of approval for relevant proposals. If avoidance and mitigation measures are not applicable or will not result in the complete reduction of prescribed impacts occurring, the assessor and proponent will need to consider options to compensate for unavoidable residual prescribed impacts. The BAM-C does not calculate biodiversity credits to offset a prescribed impact. However, the consent authority has the discretion to increase the number of biodiversity credits to be retired (or other conservation measures to be undertaken), under a planning approval. The assessment and calculation of a predicted offset obligation for any prescribed impacts must be presented prior to project determination and any impact occurring, in accordance with Section 7.14 of the *Biodiversity Conservation Act 2016*. The purpose of this requirement is to ensure: • commitments to proposed mitigation measures for residual prescribed impacts are described and can be captured in the projects consent conditions; and • the total offset obligation can be embedded in the project approval. It is recommended that the proponent and assessor consult with CPHR during the assessment process on prescribed impact assessment and calculation, when required.	Prescribed impacts - addressed in Chapter 8, Section 8.2.

Terrestrial biodiversity and ecology requirements	Section where addressed
Standard Environmental Assessment Requirements – Biodiversity (continued) **Cumulative Impacts** Cumulative impacts should be assessed through application of the Cumulative Impact Assessment for State Significant Projects guidance (DPE, Oct 2022).	Cumulative impacts - assessed in Chapter 10.
Standard Environmental Assessment Requirements – Biodiversity (continued) The EIS must contain a summary of the commitments set out in the BDAR to avoid, minimise and mitigate the biodiversity impacts of development that are to be implemented, post approval, by their inclusion in a Biodiversity Management Plan (BMP). The preparation of a BMP to fulfil the avoid and minimise requirements of the BDAR must be included as a condition of consent/approval, unless otherwise agreed with CPHR. The BMP must include detailed measures to minimise impacts on biodiversity, monitoring and reporting requirements, proposed adaptive management measures, performance criteria recommended to meet states outcomes, remedial actions to be undertaken of actions fail to achieve stated outcomes, and any additional actions relevant to the management of biodiversity.	Summary of the commitments – statement of commitments in main EIS report. Biodiversity Management Plan – to be prepared after EIS submission, prior to impacts occurring.
NPWS advice to DPHI for Project Specific SEARs The EIS must: • be prepared in consultation with the National Parks and Wildlife Service (NPWS) • include an assessment of the nature, extent and duration of any potential direct or indirect impacts on the adjacent Marrangaroo National Park (the 'park'), addressing all matters outlined in Developments adjacent to National Parks and Wildlife Service lands: guidelines for consent and planning authorities (NPWS 2020) plus the following park-and project-specific issues: – potential impacts on park visitor amenity, with the noise assessment treating Marangaroo camping area as a 'sensitive receiver', equivalent to a residence – any access that may be required on roads or trails through the park for site preparation, construction, operation or decommissioning of the proposal, noting that all access through park will be subject to NPWS authorisation which may not be forthcoming – the potential need for additional transmission lines through the park to be constructed or existing lines to be upgraded or realigned, with those impacts to be considered as part of this project and not separately – consideration of biodiversity corridors in the vicinity of the project site and demonstration that fragmentation of the park has been minimised through avoiding these areas. • identify measures proposed to prevent, control, abate, minimise and manage any potential direct and indirect impacts on the park, including an evaluation of the effectiveness and reliability of the proposed measures. • quantify any residual impacts to the park. • identify that all required buffers to limit impacts on neighbouring lands, including asset protection zones for any infrastructure, are fully contained within the development site. In terms of the impacts on biodiversity, the EIS must assess the following specific matters: • impacts to stygofauna (as part of the consideration of impacts on ground-water dependent ecosystems) • aquatic biodiversity impacts, in particular macroinvertebrates as a food source for platypus.	NPWS Consultation – addressed in main EIS report. Indirect impacts – addressed in Chapter 8, Section 8.1.3. Park visitor amenity – addressed in main EIS report. Access through national park – addressed in main EIS report. (emergency access only). Additional transmission lines – none required in the vicinity of NPWS estate. A small transmission connection is required between the High Voltage Switchyard and the adjacent existing transmission line. Refer to Chapter 1, Section 1.1. Biodiversity corridors – Chapter 4, Section 4.1.3 and Chapter 8, Section 8.2.2. Measures to address potential direct and indirect impacts on the park, and residual impacts – addressed in Chapter 8, Section 8.1.3 and Section 8.3. Buffers to limit impacts– addressed in main EIS report and in Chapter 8, Section 8.3. Stygofauna – Chapter 7 of this BDAR Assessment of aquatic biodiversity impacts is addressed in the Aquatic Ecology Assessment (Austral Research and Consulting 2025) – appended to the EIS.

Terrestrial biodiversity and ecology requirements	Section where addressed
Lithgow City Council advice to DPHI for Project Specific SEARs **2. Biodiversity** Council is satisfied that a Biodiversity Development Assessment Report (BDAR) will be prepared by an accredited assessor in accordance with the BAM and submitted with the EIS. The biodiversity assessments include terrestrial and aquatic biodiversity. Council requests that a Vegetation Management Plan is also included in the EIS.	BDAR and terrestrial biodiversity – this report. Assessment of aquatic biodiversity impacts is addressed in the Aquatic Ecology Assessment (Austral Research and Consulting 2025) – appended to the EIS. Vegetation Management Plan – to be included in Biodiversity Management Plan, to be prepared after EIS submission, prior to impacts occurring.
Supplementary SEARs – Appendix A (EPBC Act requirements) **Impacts** 10. The EIS must include an assessment of the relevant impacts of the action on the matters protected by the controlling provisions, including: i. a description and detailed assessment of the nature and extent of the likely direct, indirect and consequential impacts, including short term and long-term relevant impacts ii. a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible iii. analysis of the significance of the relevant impacts iv. any technical data and other information used or needed to make a detailed assessment of the relevant impacts.	Addressed in Chapter 8, Sections 8.1 and 8.2 and Chapter 13, Sections 13.1 and 13.2.
Supplementary SEARs – Appendix A (EPBC Act requirements) (continued) **Avoidance, mitigation and offsetting** 11. For each of the relevant matters protected that are likely to be significantly impacted by the action, the EIS must provide information on proposed avoidance and mitigation measures to manage the relevant impacts of the action including: i. a description, and an assessment of the expected or predicted effectiveness of the mitigation measures ii. any statutory policy basis for the mitigation measures iii. the cost of the mitigation measures iv. an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing v. the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program.	The impact is addressed in Chapter 8, Section 8.2.1. General avoidance, mitigation and offsetting is detailed in Chapter 8, Section 8.3.
Supplementary SEARs – Appendix A (EPBC Act requirements) (continued) 12. Where a significant residual adverse impact to a relevant protected matter is considered likely, the EIS must provide information on the proposed offset strategy, including discussion of the conservation benefit associated with the proposed offset strategy.	Addressed in Chapter 12 and Chapter 13, Section 13.1.
Supplementary SEARs – Appendix A (EPBC Act requirements) (continued) 13. For each of the relevant matters likely to be impacted by the action the EIS must provide reference to, and consideration of, relevant Commonwealth guidelines and policy statements including any: i. conservation advice or recovery plan for the species or community ii. relevant threat abatement plan for the species or community iii. wildlife conservation plan for the species iv. any strategic assessment.	Addressed in Chapter 13, Section 13.1

Terrestrial biodiversity and ecology requirements	Section where addressed
Supplementary SEARs – Appendix A (EPBC Act requirements) (continued) 14. In addition to the general requirements described above, specific information is required with respect to each of the determined controlling provisions. These requirements are outlined in paragraphs 15-17. 15. The EIS must identify each EPBC Act listed threatened species and community and migratory species likely to be impacted by the action. For any species and communities that are likely to be impacted, the proponent must provide a description of the nature, quantum and consequences of the impacts. For species and communities potentially located in the project area or in the vicinity that are not likely to be impacted, provide evidence why they are not likely to be impacted.	Addressed in Chapter 13, Section 13.1
Supplementary SEARs – Appendix A (EPBC Act requirements) (continued) 15. Further analysis of the impacts of the 2019–2020 bushfires on EPBC Act listed threatened species and communities should be undertaken during the assessment. Further assessment will determine whether the remaining habitat within the proposed action area is of substantially greater importance to the survival of the listed threatened species following the fires and/or whether the population of the species in the area is considered an important population. This information, once obtained, can be considered when determining avoidance, mitigation and offset measures for these species.	Addressed in Chapter 13, Sections 13.1 and 13.2.
Supplementary SEARs – Appendix A (EPBC Act requirements) (continued) 16. For each of the EPBC Act listed threatened species and ecological communities and migratory species likely to be impacted by the proposed action the EIS must provide a separate: i. Description of the habitat (including identification and mapping of suitable breeding habitat, suitable foraging habitat, important populations and habitat critical for survival), with consideration of, and reference to, any relevant Commonwealth guidelines and policy statements including listing advice, conservation advice and recovery plans. ii. Details of the scope, timing and methodology for studies or surveys used and how they are consistent with (or justification for divergence from) published Australian Government guidelines and policy statements. iii. Description of the relevant impacts of the action having regard to the full national extent of the species or community's range. iv. Description of the specific proposed avoidance and mitigation measures to deal with relevant impacts of the action. v. Identification of significant residual adverse impacts likely to occur after the proposed activities to avoid and mitigate all impacts are taken into account. vi. A description of any offsets proposed to address residual adverse significant impacts and how these offsets will be established. vii. Details of how the current published NSW Biodiversity Assessment Method (BAM) has been applied in accordance with the objects of the EPBC Act to offset significant residual adverse impacts. viii. Details of the offset package to compensate for significant residual impacts including details of the credit profiles required to offset the action in accordance with the BAM and/or mapping and descriptions of the extent and condition of the relevant habitat and/or threatened communities occurring on proposed offset sites.	i. is addressed in Chapter 13, Sections 13.1 and 13.2 ii. is addressed in Section 6.3.3 iii. is addressed in Chapter 8 iv. is addressed in Section 8.3 v. is addressed in Chapter 12 vi. is addressed in Chapter 13 vii. is addressed in Chapter 12 viii. is addressed in Chapter 12
Supplementary SEARs – Appendix A (EPBC Act requirements) (continued) 17. Any significant residual impacts not addressed by the BAM may need to be addressed in accordance with the EPBC Act 1999 Environmental Offset Policy. http://www.environment.gov.au/epbc/publications/epbc-act-environmental-offsets-policy	There are unlikely to be any significant residual impacts from the project that are not addressed by the BAM. See Section 13.1.

This assessment also considers relevant governmental assessment requirements, guidelines and policies, and was prepared in consultation with the relevant government agencies.

1.2.2 Other relevant reports

This BDAR has been prepared with reference to other technical reports that were compiled as part of the EIS. The other relevant reports referenced in this BDAR are listed below:

- Aquatic Ecology Assessment (Austral Research and Consulting 2025) – appended to the EIS
- Groundwater Impact Assessment (EMM 2025a) – appended to the EIS
- Noise and Vibration Impact Assessment (EMM 2025b) – appended to the EIS
- Soil, Land Use and Rehabilitation Assessment (Minesoils 2025) – appended to the EIS
- Traffic Impact Assessment (EMM 2025c) – appended to the EIS
- Surface Water Assessment (EMM 2025d) – appended to the EIS
- Excavated Rock Management Strategy (EMM, 2025e) – appended to the EIS.

1.2.3 Other information sources

The main sources of pre-existing data used to inform this assessment, including databases, spatial datasets and previous reports are listed below.

i Publications and databases

To provide context for the project, data about flora and fauna species, populations, communities and habitats from the locality were obtained from the following databases:

- NSW BioNet (NSW Department of Environment, Climate Change, Energy and Water; NSW DCCEEW):
  - BioNet Atlas – threatened species records
  - BioNet Threatened Biodiversity Data Collection (TBDC)
  - BioNet Vegetation Classification database – Plant Community Types (PCTs)
- NSW Threatened biodiversity profile search (NSW DCCEEW)
- Protected Matters Search Tool (PMST) (Commonwealth Department of Climate Change, Energy, the Environment and Water; Commonwealth DCCEEW)
- Commonwealth Species Profile and Threats Database (Commonwealth DCCEEW)
- Directory of Important Wetlands: Nationally Important Wetlands (DoEE 2018)
- NSW Wetlands (DPIE 2018)
- Groundwater Dependent Ecosystems Atlas (Bureau of Meteorology; BoM)
- PlantNET (The NSW Plant Information Network System) (Royal Botanic Gardens and Domain Trust)
- Atlas of Living Australia (National Collaborative Research Infrastructure Strategy (NCRIS) and CSIRO)
- Google Earth™ and MetroMap (Aerometrex) aerial images for the project area and locality.

ii Spatial data

Spatial data used to define the disturbance footprint was obtained from LLP. Base map data was obtained from the Department of Finance, Services and Innovation (DFSI) NSW databases, with cadastral data obtained from DFSI digital cadastral database. Mapping for stream orders was obtained from NSW Department of Primary Industries (DPI).

The following spatial datasets were utilised during the development of this report:

- NSW State Vegetation Type Map (NSW DCCEEW 2022)
- Mitchell Landscapes Version V3.1 (OEH 2016)
- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7 (DCCEEW 2017).

Mapping was undertaken using a hand-held GPS unit, Collector for ArcGIS™ and Survey123 for ArcGIS™ installed on mobile tablet computers and mobile phones, and aerial photo interpretation. Accuracy of GPS devices is generally ±5 m. Mapping has been produced using a Geographic Information System (ArcGIS™).

1.3 Consultation

A briefing of the project was provided to Conservation Programs, Heritage and Regulation (CPHR) Group of NSW DCCEEW (formerly Biodiversity, Conservation and Science (BCS) Group of NSW DCCEEW) and National Parks and Wildlife Service (NPWS) in December 2023. The briefing provided an overview of the proposed concept design and identified key representatives at CPHR for ongoing consultation, as required.

Consultation was undertaken with CPHR regarding survey requirements for several species for which detailed survey guidelines have not been published. Detailed responses were provided for Purple Copper Butterfly, Glossy Black Cockatoo and Gang-gang Cockatoo. Summaries of CPHR responses and assessment outcomes of consultation are provided in Table 1.2, Table 1.3, and Table 1.4.

Table 1.2 Purple Copper Butterfly guidance and outcomes

Item in question	CPHR response	Outcome
Habitat suitability (general)	All PCTs on the subject land that are associated with the species in the TBDC above 850 metres (m) elevation and if *Bursaria spinosa subsp. lasiophylla* is present in the construction envelope or is within 40 m of *Bursaria spinosa subsp. lasiophylla* (BCS 2025b).	CPHR advice indicated that 850 m above sea level (asl) could be considered the lower altitudinal limit of the species, however, the habitat constraint for the species lists >800 m as the constraint. Analysis of records indicated that all known recorded appeared to be from areas above 850 m asl and this was initially thought by the BDAR author to be an appropriate lower level for defining potential habitat for the species. According to the most recent (August 2024) conservation assessment of the species, "*Paralucia spinifera* is restricted to areas above c. 870 m above sea level (asl), based on GIS analysis of all records" (NSW TSSC 2024). However, the author has subsequently observed the species at an altitude of approximately 815 m asl,
Habitat suitability (density of Bursaria)	Populations can occur in isolated patches, and can re-colonise potential habitat. Plants do not need to be intertwined to support the butterfly and its larvae. Individual larvae are just less likely to move between plants that aren't intertwined. Adults still lay their eggs on plants that aren't intertwined, and individual plants can support numerous larvae. Therefore it would not be appropriate to exclude areas where *Bursaria spinosa* is only found as isolated (> 40 m from the next patch), individual plants or small (< 10 plants) patches of plants that are not intertwined.	

Item in question	CPHR response	Outcome
Habitat suitability (sun exposure)	This species is an early successional specialist (its prime habitat niche is 2 to 4 years post fire). The vegetation structure of an area that is not currently exposed to 'nearly all-day sun' can change when a fire occurs. Therefore it would not be appropriate to exclude areas that are not exposed to nearly all-day sun due to vegetation structure and/or aspect.	indicating that the >800 m level indicated in the TBDC is appropriate. Available scientific literature suggests that the species is only likely to persists in very low numbers in areas that have not been subject to recent fire or physical disturbance, making it very difficult to detect in such circumstances (NSW TSSC 2024). Refer to Table 6.17 for more detailed discussion of scientific literature and the species' ecology. This literature also indicates that the density of the food plant is a very strong indicator of habitat suitability. Due to the lack of any recent substantial disturbance (e.g. fire, canopy clearing) through most of the site, if the species occur in the construction envelope it is likely to occur at very low density and to be very difficult to detect. Surveys were not comprehensive due to project timing, conflicting survey guidance, and difficulty in accessing sites for repeat visits during the short seasonal window and under appropriate weather conditions. The species was not recorded in the construction envelope but was opportunistically recorded approximately 300 m away in a treeless powerline easement where the host plant was abundant and recent trimming of shrubs had occurred. Due to the difficulty in detecting the species where it occurs at low density, a species polygon has been prepared that includes the most suitable habitat for the species, defined as areas above 800 m asl that are within 40 m of larger patches of *Bursaria spinosa* (>5 plants within 5 m of one-another). Such larger patches were considered to be the most suitable habitat as "larvae feed on young growth of the host plant and prefer clumps of plants with intertwining branches, as larvae do not traverse open ground between plants" (NPWS 2001 in (NSW TSSC 2024)). Areas of potential habitat in the existing power transmission corridor that have been recently disturbed were excluded from the species polygon as they were adequately surveyed and if present the species would be expected to occur at high density in such circumstances and to be more readily detectible.
Habitat suitability (altitude limits)	The purple copper butterfly has since been detected <900 m. So we now recommend elevations >850 m, rather than >900 m.	
Survey method	Meandering transects through suitable habitat targeting *Bursaria spinosa* subsp. *lasiophylla*. GPS tracks of transects need to be recorded. Adults are known to forage on other flowering native species, generally remaining in the vicinity of Bursaria patches. Search from the ground up to a height of 2 m for adults, ensure adjacent open habitat to Bursaria patches is searched for sunning adults. Adults, when disturbed, most often take flight briefly then land close by providing an opportunity to identify individuals to species level.	This method was adopted for surveys.

Item in question	CPHR response	Outcome
Survey timing	September to mid-October (Adults) Reference sites should be monitored during the expected flying period and used to guide survey timing at the target site (aspect, elevation and seasonal variability can influence survey period.	A local reference site was checked for Purple Copper Butterfly during each survey period.
Survey conditions	Warm to hot day (above 15 degrees Celsius by 10:00 am). Survey should be undertaken during the warmest part the day (between 10:00 am to 2:00 pm). Clear or mostly cloudless sky (pause surveys if sun becomes obscured by cloud). Calm to low wind (an average of ≤1 to 10 km/h over a 10-minute period. This equates to Beaufort-values of Windforce that are ≤2 (light breeze).	Surveys were undertaken during these conditions when possible (refer to Appendix C).
Survey effort (effort per survey)	This depends on the potential habitat. When conducting whole-area monitoring at a site, we focus on Bursaria (and the areas between the Bursaria) that are in sunlight. If there are patches of Bursaria in the shade (i.e. under dense canopy or from a hill), then we do not search those patches at that time. Those patches are surveyed at a different time if/when they are in sunlight.	No quantitative guidance provided. Advice used to focus survey effort in relation to sunlight.
Survey effort (number of visits per site)	This depends on the weather conditions and the timing of the surveys. If surveys are conducted during optimal conditions and peak flying period, then fewer surveys will be required. If suboptimal conditions and/or outside of the peak flying period, then more surveys will be required. Detectability is more difficult if it is windy, as the butterflies do not fly as much. The use of a stick to lightly tap plants (including grass and other vegetation) whist searching can help flush them. Surveys should be repeated three times within the survey period if species is not detected in one of the preceding surveys (under the above survey conditions). Surveys should be repeated at least two weeks apart.	Specific advice used to guide planning for future surveys. Advice used to focus survey effort in relation to temperature and wind conditions.
Survey effort (surveys for larvae)	BCS is unaware of any resources to assist with larvae identification. This is part of reason why we no longer recommend larvae surveys. Other reasons include (1) the surveys are quite specialised (2) they require greater effort (time, attention and patience), and (3) there appears to be lower detectability for site presence, than there is for adults.	Planned surveys for larvae were abandoned due to low confidence in the ability of detection by this method.

Table 1.3 Glossy Black Cockatoo guidance and outcomes

Item in question	CPHR response	Outcome
Applicability of an area-based survey approach to detect breeding birds, comprising: a) Establish a 100 m grid across the area containing potential nesting trees b) An observer spending approximately 15 to 20 minutes in each 100 m x 100 m grid cell during the species' breeding season, searching for and recording suitable nesting hollows and glossy-black cockatoo breeding activity.	Confirming breeding for glossy-black cockatoos is challenging as many pairs exhibit secretive behaviour near nests. In addition, their contact calls are typically discreet wheezing and grating sounds, repeated over a short time. This makes detection and triangulation of individuals difficult, especially in densely treed habitat. In accordance with the Threatened Biodiversity Data Collection (TBDC) survey requirements, we recommend that signs of breeding are first confirmed within the site, via comprehensive dedicated surveys. If signs of breeding are detected, an assessment of all suitable hollow-bearing trees will be required to determine its use by the glossy-black cockatoo. In relatively open vegetation the 20-minute area-based survey approach proposed may be considered appropriate. However, in more heavily treed areas it is unlikely that 20 minutes would be sufficient to locate all potential hollows and detect breeding activity in a one-hectare area. In general, we advise that a high density of hollows will require a commensurately large survey effort. If signs of breeding are confirmed and assessment of potential breeding habitat is required, we recommend that a tiered approach be implemented. Areas can be removed from further assessment based on confirmation of the absence of habitat features, e.g. vegetation which does not contain suitable hollows.	No quantitative guidance provided. Additional survey effort was undertaken to detect breeding of Glossy Black Cockatoo (see Section 6.3.3iia). Areas that do not contain suitable hollows (i.e. at least 8 m above the ground; and in stems with a diameter of at least 30 centimetres (cm); and hollow diameter is at least 15 cm; and stem angle is at least 45 degrees) were removed from further assessment. In accordance with this advice, and on the observation of a pair of birds during the breeding season, one nesting tree was assumed present and a biodiversity credit requirement was calculated on this basis.
Would you have any other suggestions for a survey approach?	In consultation with the species expert, we have previously provided advice to accredited assessors on a suggested approach to surveying glossy-black cockatoos, where signs of breeding have been detected. The advice applied to densely treed habitat which contained a resident population. As per your request, a copy of this advice has been provided in Appendix A.	Detailed, quantitative advice was provided by BCS regarding confirming the presence of nesting trees. However, due to the timing of the detection of the species, and the number of potential breeding hollows present, full implementation of the described methods was not able to be undertaken for all potential breeding hollows in the construction envelope. Given the low level of activity observed on the site, despite extensive surveys during the species' breeding season, it is unlikely that more than one breeding pair is utilising the site.
Is observation of a pair of birds inspecting or renovating a tree hollow sufficient evidence to conclude that the hollow constitutes an actual nest site and is there anything to be gained from revisiting any such locations to verify actual nesting?	We agree that renovation of a hollow would be considered sufficient to confirm the hollow as a nest site. Additionally, the presence of a male, or pair, within 20 m of a potential hollow during the core breeding period would strongly indicate that the hollow may be a nest site and would warrant further observation. A nesting tree can also be assumed present, in accordance with section 5 of the Biodiversity Assessment Method (BAM).	In accordance with this advice, and on the observation of a pair of birds during the breeding season, a nesting tree was assumed present and a biodiversity credit requirement was calculated on this basis.

Table 1.4 Gang-gang Cockatoo guidance and outcomes

Item in question	BCS response	Outcome
Applicability of an area-based survey approach to detect breeding birds, comprising: a) Establish a 100 m grid across the area containing potential nesting trees b) An observer spending approximately 15 to 20 minutes in each 100 m x 100 m grid cell during the species' breeding season, searching for and recording suitable nesting hollows and Gang-gang Cockatoo breeding activity.	Gang-gang cockatoos are not an easy species in which to confirm breeding as many pairs exhibit elusive and secretive behaviour near nests. BCS recommend that a tiered approach be implemented. Areas can be removed from the potential species polygon based on confirmation of the absence of habitat features, e.g. vegetation that did not contain hollows of the required size at the required height during surveys. In relatively open vegetation the 20-minute area-based survey approach proposed would be supported by BCS. However, in more heavily timbered areas it is unlikely that 20 minutes would be sufficient to locate all potential hollows and detect breeding activity in a 1-hectare (ha) area.	No quantitative guidance provided. Additional survey effort was undertaken for the detection of breeding birds (see Section 6.3.3iia). Areas that do not contain suitable hollows (i.e. at least 3 m above the ground and with hollow diameter of 7 cm or larger) were removed from further assessment. Due to the often elusive and secretive behaviour of breeding birds near nests and their difficulty of detection, a conservative approach was taken. The species was assumed to be breeding in the construction envelope in the where of birds were observed inspecting and/or renovating hollows and a biodiversity credit requirement was calculated on this basis.
Would you have any other suggestions for a survey approach?	Noting the extensive repeated survey effort required to locate all actual nest trees on the project site to determine breeding, BCS recommend that the survey effort prioritise the elimination of areas that do not contain suitable hollows, then establish the location of potential nest hollows, assume presence, and create polygons accordingly.	Areas that do not contain suitable hollows were removed from further assessment. Despite surveys being unable to conclusively determine if particular trees were being actually utilised for nesting, as opposed to being inspected, eleven likely nesting sites were identified.
Is observation of a pair of birds inspecting or renovating a tree hollow sufficient evidence to conclude that the hollow constitutes an actual nest site and is there anything to be gained from revisiting any such locations to verify actual nesting?	We agree that renovation of a hollow would be considered sufficient to confirm the hollow as a nest site. Additionally, the presence of a male, or pair, within 20 m of a potential hollow during the core breeding period would strongly indicate that the hollow may be a nest site and would warrant further observation. A nesting tree can also be assumed present, in accordance with section 5 of the BAM.	In accordance with this advice, and on the observation of pairs of birds during the breeding season, eleven nesting trees were assumed present. This resulted in approximately 50% of the potential breeding habitat for the species being assumed to be actual breeding habitat and included in the species polygon and biodiversity credit requirement calculations.

A follow up briefing of the draft BDAR findings was provided to CPHR NPWS in October 2025, and included:

- discussion on survey effort and justification, in particular where effort differed to the guidelines
- presentation of draft BDAR findings, including quantified impacts native vegetation, habitat and threatened species

- discussion on serious and irreversible impact (SAII) assessment and application of SAII Guidelines where important habitat is not present, but species have been recorded
- update on offsets strategy and early biodiversity stewardship agreement (BSA) site assessments

1.4 BAM contributors and declaration

1.4.1 BAM contributors

The following people contributed to this BDAR and the associated biodiversity assessment.

Table 1.5 Key personnel involved in preparing this BDAR

Name	Qualifications	Experience	Role
Paul Rossington	BSc, (Biology) Master (Wildlife Management) BAAS18065	18 years	Lead author Field surveys Technical guidance Technical reviews
Hayden Beck	Doctor of Philosophy PhD (Science) Master of Science (Research) Bachelor of Environmental Science (Hons) BAAS19000	10 years	Technical reviews Cumulative impact assessment
Jason Brown	BSc, Science (Env mgn/GeoSci) BAAS21017	18 years	Fauna surveys
Ross Davey	BSc	3 years	Field surveys
Amy Rowles	BSc (Honours)(Ecology)	26 years	Ultrasonic bat call analysis
Nicole McVicar	Bachelor of Science BAAS18077 Bush Regeneration Certificate II	15 years	BAM Plot surveys Targeted flora surveys
Maya Potapowicz	Bachelor of Environmental Science (Environmental Management), BAAS18157	>20 years	BAM Plot surveys
Ben Lewis	Bachelor of Applied Science (Hons)	>20 years	Fauna surveys
Andrew Carty	Bachelor of Environmental Science Natural Area Restoration and Management Cert. IV BAM Accredited Assessor BAAS20021	19 years	BAM Plot surveys
Stephen Dalleywater	Experienced conservation detection dog handler with qualifications in dog training and zoo keeping.		Koala detection dog handler
Avery Keller	Bachelor of Applied Science in Wildlife Biology (UQ). Experienced conservation detection dog handler.		Koala detection dog handler

1.4.2 Certification under clause 6.15 Biodiversity Conservation Act 2016

I certify that this report has been prepared based on the requirements of, and information provided under, the Biodiversity Assessment Method (DPIE 2020) and Clause 6.15 of the BC Act.

Name: Paul Rossington



Signature:

Date: 30 January 2026

BAM Assessor Accreditation no: BAAS18065

1.4.3 Conflict of interest

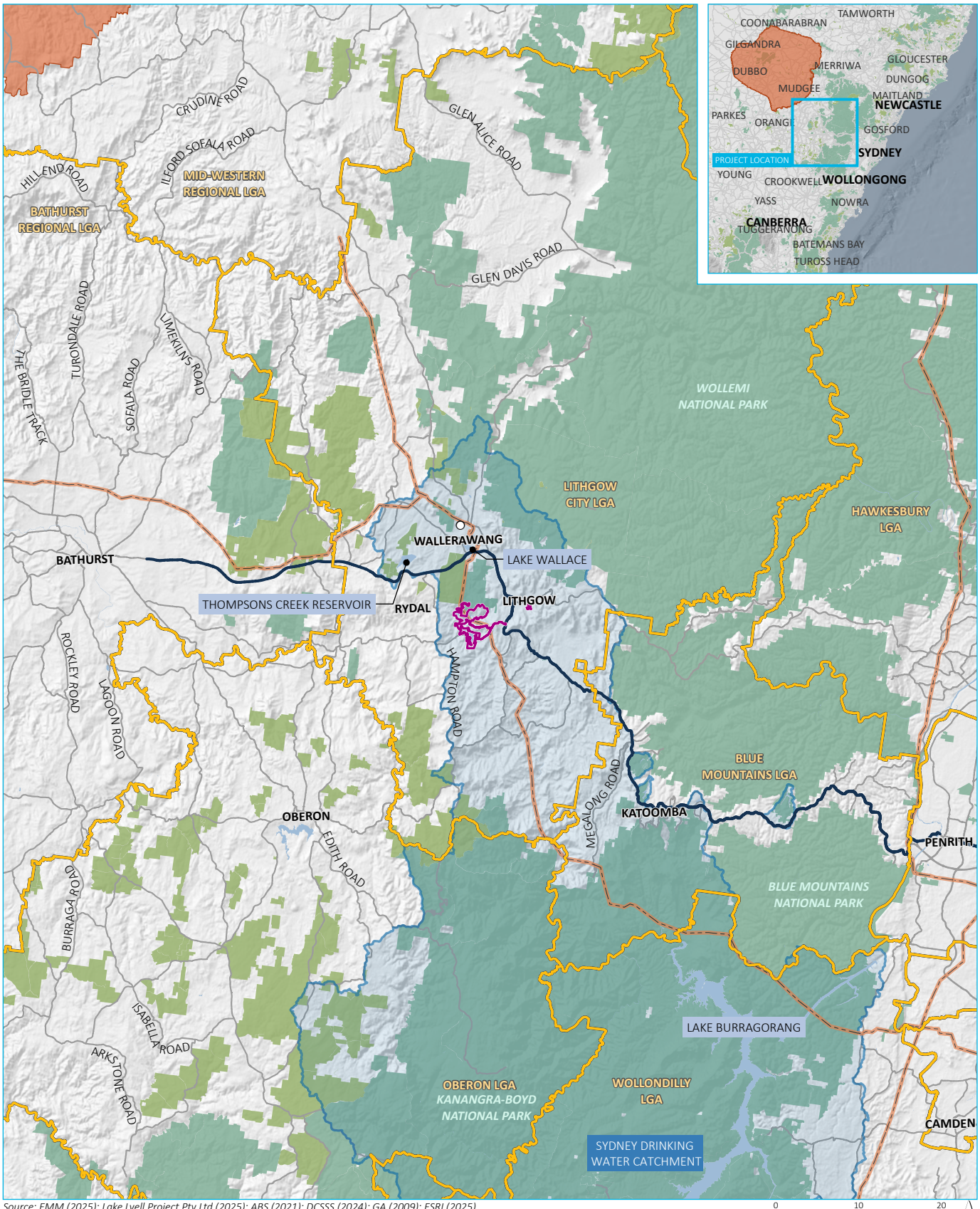
As per the Accredited BAM Assessor Code of Conduct, BAM Accredited Assessors must not act in circumstances where there is actual, perceived, or potential conflict of interest. I declare that I have considered the circumstances and there is no actual, perceived, or potential conflict of interest. This declaration has been made in the interests of full disclosure to the decision-maker. Full disclosure has also been provided to the client.

Name: Paul Rossington



Signature:

Date: 30 January 2026



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); ABS (2021); DCSSS (2024); GA (2009); ESRI (2025)

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KEY

- Project area

Existing environment

- Mt Piper Power Station
- Major road
- Great Western Highway
- 330 kV transmission line
- Named waterbody
- NPWS reserve
- State forest
- Local government area
- Sydney Drinking Water Catchment
- Central West Orana Renewable Energy Zone

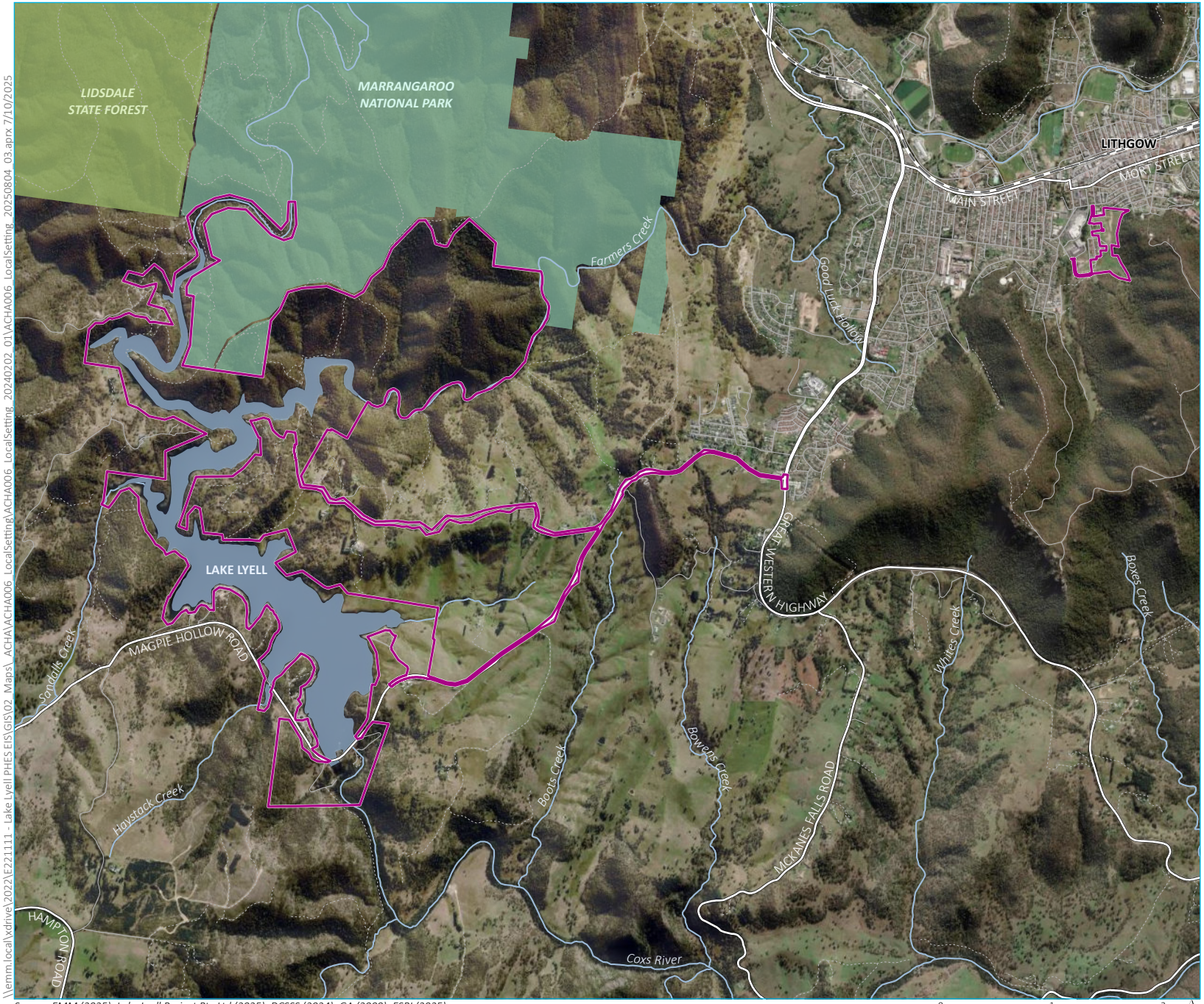
INSET KEY

- Major road
- NPWS reserve
- State forest
- Central West Orana Renewable Energy Zone

Regional context

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 1.1

EMM
creating opportunities



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KEY

- Project area

Existing environment

- Rail line
- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); ESRI (2025)

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Local context

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 1.2

EMM
creating opportunities

2 Description of the project

A detailed description of the project, including an overview of its design, construction and operation is provided in the project's EIS. The EIS (specifically Chapter 3 and Appendix B) should be read in conjunction with this report. A summary of the project's key elements is provided below.

The project design, as shown in Figure 2.1, can be broadly categorised into:

- pumped hydro generation components – including a 5.3 gigalitre (GL) upper reservoir to be constructed behind the southern ridge of Mount Walker, a 33.5 GL lower reservoir (existing Lake Lyell), inlet/outlet structures, and an underground powerhouse, surge shaft and waterway tunnels
- transmission connection components – including a new high voltage switchyard and connection to the existing 330 kilovolt (kV) transmission line that runs through the site
- site access and ancillary facilities – including upgrade of existing and construction of new access roads and bridges, a diversion and infill of a section of Lake Lyell, administration and utilities
- other construction components or works – including geotechnical investigations, temporary workforce accommodation, site work pads, laydown areas and facilities, and spoil management.

Construction will be completed in stages, including:

- pre-construction / enabling works – consisting of initial access works (internal and external roads), geotechnical investigations, site establishment and preparation of the worker's accommodation camp
- main works – consisting of all other construction activities needed to enable operation of the project.

During operation, the project will act as an electrical energy storage system through the conversion of electrical to kinetic energy to gravitational energy and back via water as it is transferred from the elevated upper reservoir to a lower reservoir. The project will provide services to the wholesale 'spot' market on the national electricity market (NEM), and support ancillary services used to manage the power system reliably.

After the 80 to 100-year design life of the project, the asset may remain viable for a plant refurbishment and extension of life as has been seen for other older assets globally. Following the plants final refurbishment or once it has reached the end of its serviceable life then the project would look to return the site to a more natural state and encourage community beneficial use.

2.1 Project areas

Approval for the project is being sought based on feasibility and concept designs as is common for projects of this size and scale. To accommodate minor changes and amendments to the design as it progresses, a 'project area', 'construction envelope', 'disturbance footprint' and 'operational footprint' approach is being adopted for the project. This approach is aimed at ensuring environmental impacts are assessed as accurately as possible, whilst accounting for the current level of design and the likelihood of design refinements occurring as the project progresses towards construction.

Project elements and terminology referred in this BDAR are summarised in Table 2.1. Further detail regarding these terms and the project design are provided in Section 2. The project area, construction envelope and disturbance footprint are shown in Figure 2.1.

Table 2.1 Project elements referred in this BDAR

Project elements	Definition
Project area	The project area is a broader buffer around the project and represents the area that was investigated during the environmental assessments. The project area is largely confined to land owned by EnergyAustralia except for the primary access route on Lithgow City Council (Council) owned land and the alternative temporary accommodation camp site in Lithgow. The project area includes both the land that will be physically disturbed for the project (directly and indirectly) as well as land where no disturbance or impact will occur.
Construction envelope	The construction envelope represents the maximum extent of where disturbance may occur during the construction of the project. To derive the construction envelope, buffers have been applied around project infrastructure and work areas to provide a level of flexibility where required. Some areas have reduced buffers to indicate reduced flexibility due to environmental or design constraints to be avoided. The construction envelope for the project covers an area of around 197 ha.
Disturbance footprint (equivalent to subject land in the BAM)	The disturbance footprint represents the physical disturbance that can be expected as part of the construction works. As the design is refined, the final siting of the disturbance footprint can move within the construction envelope, subject to the recommended environmental management measures, and provided it does not exceed any limits defined by the construction envelope or vegetation clearing thresholds. Noting that two options are presented for a temporary accommodation camp and ultimately only one will be selected and built, the disturbance footprint considering each option is: • approximately 137 ha for the project with the preferred Lakeside camp, or • approximately 146 ha for the project with a Town camp. Pre-construction and enabling work activities will form part of an early works package and are a subset of the total disturbance needed to construct the project. The early works disturbance footprint consists of a maximum of 37 ha of the total disturbance footprint, with the preferred Lakeside camp.
Early works disturbance footprint	The area of the disturbance footprint located in areas subject to early works as described in Section 2.2.1.
Main works disturbance footprint	The area of the disturbance footprint located in areas subject to main works as described in Section 2.2.2.
Progressive rehabilitation	Progressively, and at the end of construction, temporary components that are required to support the construction of the project will be rehabilitated and returned to a state representing its previous use. The exceptions to this are the areas required for permanent operation of the project, which would be retained (see below operational footprint). Approximately 74 ha of the disturbance footprint would be progressively rehabilitated.
Operational footprint	The operational footprint represents the permanent disturbance of the land following progressive rehabilitation. The operational footprint covers an area of around 47 ha. A further 16 ha of the disturbance footprint comprises external road upgrades that would be passed back to Council and does not form part of the operational footprint. This includes Magpie Hollow Road and Sir Thomas Mitchell Drive and associated intersections.
Study area	The study area is the area that was investigated in detail during the terrestrial biodiversity fieldwork that informed the preparation of this BDAR and encompasses the construction envelope and some additional adjacent lands that were previously thought to be likely impacted.

2.2 Project stages

2.2.1 Early works

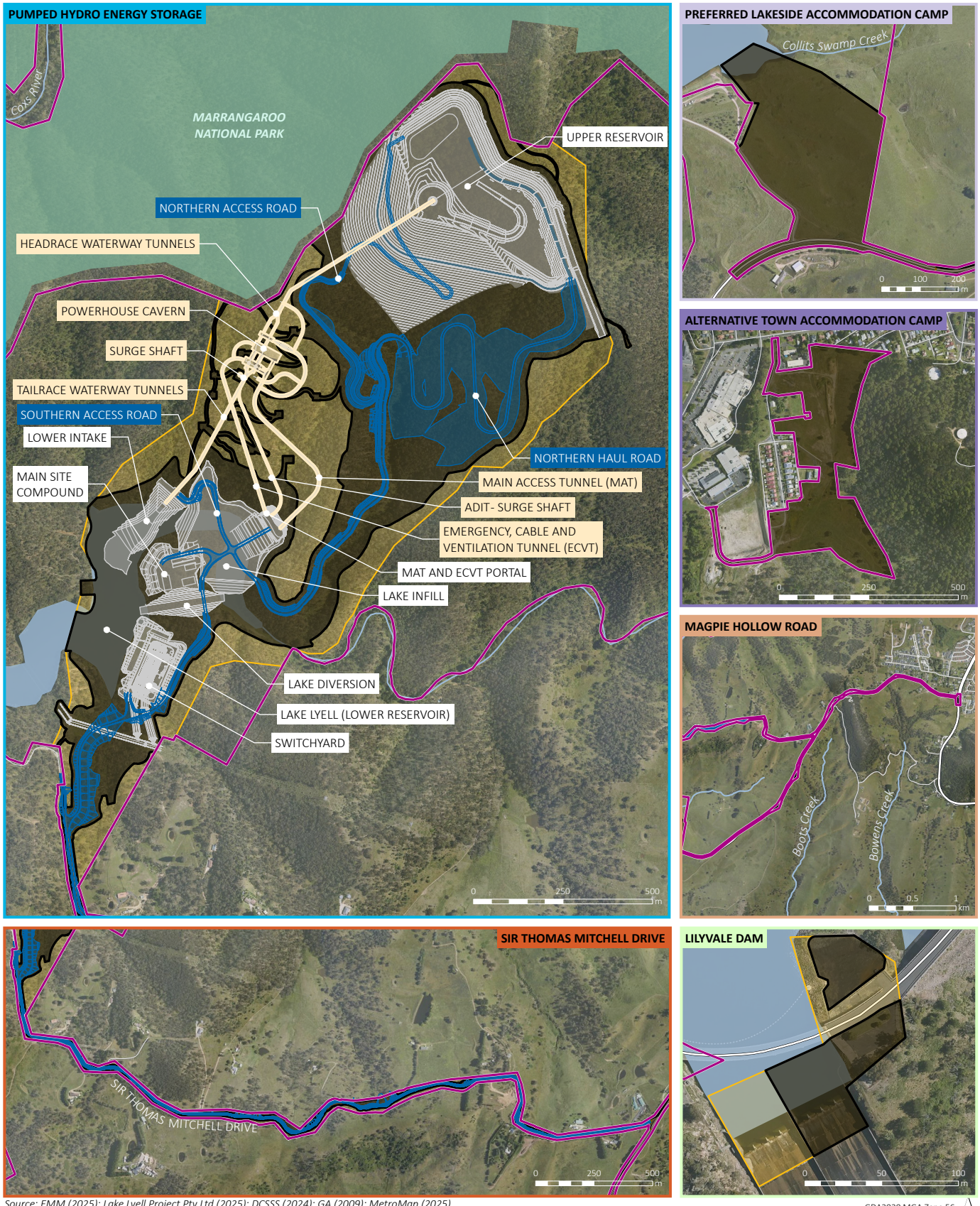
Pioneering and early access establishment is needed to inform finalisation of the design and construction methodologies, as well as enabling works to prepare the site for construction and including implementing any early environmental management measures. These activities occur before the main construction work and are critical to the overall construction timeframe. It is anticipated this phase will involve:

- geotechnical drilling and geophysical survey, including utilising existing access tracks (no clearing required) and clearing new pioneering tracks and drill pads, and barge launch and access where needed
- establishing temporary power supply to an early works staging area and commencing the application for Endeavour Energy 11 kV connection for main construction works
- external road upgrades (Magpie Hollow Road and Sir Thomas Mitchell Drive, and respective intersection works) to facilitate heavy vehicle access
- establish early works compounds, including a storage area off Sir Thomas Mitchell Drive within existing cleared areas, and a compound at the proposed switchyard location
- establishment of the workers accommodation camp
- securing the site using fencing and gates, as required
- temporarily lowering existing Lake Lyell reservoir by up to 3.2 metres (m) through concurrent maintenance works on the fuse gates (required as part of existing operations) at Lilyvale Dam.

The pre-construction and enabling work activities were selected and developed based on those critical activities needed but also have considered works that would result in only minor environmental and community impacts. In some instances, clearing of vegetation is unable to be avoided and appropriate offsets will be secured for any clearing. All disturbance activities occur within the overall disturbance footprint for the project and would be subject to an early works management plan, approved by the Secretary prior to commencing.

2.2.2 Main works

The key project infrastructure is outlined in Chapter 2. The project will require supporting ancillary facilities and activities to enable the construction of this infrastructure, including haul roads and temporary bridges, site compounds, batch plant, laydown and stockpile areas, coffer dams, stormwater basins, etc. Key construction activities will involve vegetation clearing, grubbing, excavation, tunnelling, boring, lining, and the installation of plant and machinery. The construction layout and facilities needed for the project have informed the definition of the disturbance footprint. Following construction, any construction ancillary facilities not needed for operation will be decommissioned and rehabilitated.

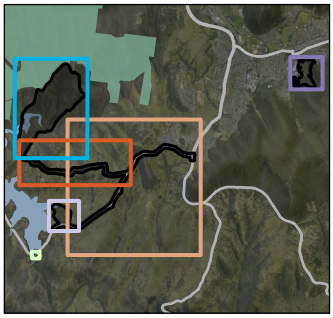


Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); GA (2009); MetroMap (2025)

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KEY

- Project area
- Permanent road
- Above ground design
- Underground design
- Construction envelope
- Disturbance footprint

Existing environment

- Major road
- Minor road
- Named watercourse
- Named waterbody
- NPWS reserve

Project overview

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 2.1

EMM
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3 Legislative context

This chapter provides a brief outline of the key biodiversity legislation and government policy considered in this assessment.

3.1 Commonwealth

3.1.1 Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities, heritage places and water resources which are defined as Matters of National Environmental Significance (MNES) under the EPBC Act. These are:

- world heritage properties
- places listed on the National Heritage Register
- Ramsar wetlands of international significance
- threatened flora and fauna species and ecological communities
- migratory species
- Commonwealth marine areas
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mining)
- water resources, in relation to coal seam gas or large coal mining development.

Under the EPBC Act, an action that may have a significant impact on a MNES is referred to Commonwealth DCCEEW for determination as to whether or not it is a controlled action. If deemed a controlled action, the project is assessed under the EPBC Act and a decision made as to whether or not to grant approval. A 'controlled action' can only proceed with the approval of the Commonwealth Minister for the Environment.

On 3 April 2023, the delegate for the Minister determined that the project was a controlled action under section 75 of the EPBC Act (EPBC 2022/09445). The EPBC Act controlling provisions for the proposed actions are:

- listed threatened species and communities (chapter 18 and section 18A)
- listed migratory species (sections 20 and 20A).

The project will be assessed in accordance with the bilateral assessment agreement between the Commonwealth and NSW. An assessment of the project against the EPBC Act is provided in Section 13.1.

3.2 State

3.2.1 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) was enacted to encourage the consideration and management of impacts of proposed development or land-use changes on the environment and the community. The EP&A Act is administered by the NSW Department of Planning, Housing and Infrastructure (DPHI).

The EP&A Act provides the overarching structure for planning in NSW; however, is supported by other statutory environmental planning instruments (EPIs) including State environmental planning policies (SEPPs) and local environmental plans (LEPs).

The project has been declared by the NSW Minister for Planning and Public Spaces to be State significant infrastructure (SSI) and critical State significant infrastructure (CSSI) under the NSW EP&A Act. In accordance with section 5.22(2) of the EP&A Act, EPIs do not apply to or in respect of SSI, except that they apply to the declaration of infrastructure as SSI or CSSI and to the declaration of development that does not require consent.

i State Environmental Planning Policy (Planning Systems) 2021

In June 2024, the Minister for Planning and Public Spaces declared the project to be SSI and CSSI as it is a development that is essential for the State for economic, social, and environmental reasons. This required schedule 5 of the *State Environmental Planning Policy (Planning Systems) 2021* to be updated to reflect the CSSI status of the project. As CSSI, the project is subject to part 5, division 5.2 of the EP&A Act, which requires the preparation of an EIS in accordance with SEARs and the approval of the Minister.

ii State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapters 3 and 4 of the *State Environmental Planning Policy (Biodiversity and Conservation) 2021* (Biodiversity and Conservation SEPP) aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline. The Biodiversity and Conservation SEPP adopts two Chapters of relevance to Koala management, with chapter 3 – *Koala habitat protection 2020*, and Chapter 4 – *Koala habitat protection 2021*.

In nine metropolitan Sydney local government areas (LGA) (Blue Mountains, Campbelltown, Hawkesbury, Ku-Ring-Gai, Liverpool, Northern Beaches, Hornsby, Wollondilly) and the Central Coast LGA; chapter 4 of the Biodiversity and Conservation SEPP applies to all land use zones. Outside of these areas, chapter 3 continues to apply to all land zoned RU1, RU2, and RU3. In the context of the project, chapter 3 of the Biodiversity and Conservation SEPP applies because it is outside of the LGAs mentioned above and contains land zoned RU1.

The project is subject to part 5, division 5.2 of the EP&A Act and does not require a development application for consent under part 4 of the EP&A Act. The Biodiversity and Conservation SEPP therefore does not apply to the project per section 5.22 of the EP&A Act. Nonetheless, consideration has been given to the potential occurrence and impacts upon the Koala within this BDAR.

3.2.2 Biodiversity Conservation Act 2016

The BC Act is the legislation responsible for the conservation of biodiversity in NSW through the protection of threatened flora and fauna species, populations and ecological communities. The BC Act, together with the *Biodiversity Conservation Regulation 2017* (BC Regulation), established the Biodiversity Offsets Scheme (BOS).

The BOS includes establishment of the Biodiversity Assessment Method (the BAM, (DPIE 2020a)) for use by accredited persons in biodiversity assessment under the scheme. The purpose of the BAM is to assess the impact of actions on threatened species and threatened ecological communities, and their habitats and determine offset requirements. For major projects, use of the BAM is mandatory, unless a BDAR waiver is granted.

The BAM sets out the requirements for a repeatable and transparent assessment of terrestrial biodiversity values on land in order to:

- identify the biodiversity values on land subject to proposed development area
- determine the impacts of a proposed development, following all measures to avoid, minimise and mitigate impacts

- quantify and describe the biodiversity credits required to offset the residual impacts of proposed development on biodiversity values.

As SSI and CSSI, assessment of the likely biodiversity impact of the development needs to be in accordance with section 7.9 of the BC Act and the BAM. Section 7.9 of the BC Act requires that all SSI applications are to be accompanied by a BDAR, unless the Planning Agency Head and the Environment Agency Head determine that the proposed development is not likely to have any significant impact on biodiversity values. No such determination has been made for the project and, accordingly, a BDAR is required for the project.

This BDAR has been undertaken in accordance with the requirements of the BAM (2020).

3.2.3 Fisheries Management Act 1994

The NSW *Fisheries Management Act 1994* (FM Act) contains provisions for the conservation of fish stocks, key fish habitat (KFH), biodiversity, threatened species, populations and ecological communities. It regulates the conservation of fish, vegetation and some aquatic macroinvertebrates and the development and sharing of the fishery resources of NSW for present and future generations. The FM Act lists threatened species, populations and ecological communities, key threatening processes (KTPs) and declared critical habitat. Assessment guidelines to determine whether a significant impact is expected are detailed in section 220ZZ and 220ZZA of the FM Act.

Another objective of the FM Act is to conserve KFH. These are defined as aquatic habitats that are important to the sustainability of recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species. KFH is defined in section 3.2.1 and 3.2.2 of the *Policy and Guidelines for Fish Conservation and Management* (DPI 2013).

The impact of the project on threatened aquatic species, populations, communities, habitats and KFH has been assessed separately and is presented in the aquatic ecology assessment (Austral Research and Consulting 2025).

3.2.4 Biosecurity Act 2015

The primary objective of the NSW *Biosecurity Act 2015* (Biosecurity Act) is to provide a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matters, dealing with biosecurity matters, carriers and potential carriers, and other activities that involve biosecurity matters, carriers or potential carriers.

The Biosecurity Act stipulates management arrangements for weed biosecurity risks in NSW, with the aim to prevent, eliminate and minimise risks. Management arrangements include:

- any land managers and users of land have a responsibility for managing weed biosecurity risks that they know about or could reasonably be expected to know about
- applies to all land within NSW and all waters within the limits of the State
- local strategic weed management plans will provide guidance on the outcomes expected to discharge duty for the weeds in that plan.

The Central Tablelands Regional Strategic Weed Management Plan 2023-2027 (CTLLS 2022) applies to the project area. This document outlines how government, industry, and the community will share responsibility and work together to identify, minimise, respond to and manage weeds within the Central Tablelands Region. The plan also supports regional implementation of the Biosecurity Act.

The provisions of the Biosecurity Act are discussed further in Section 13.3.

Stage 1 – Biodiversity assessment

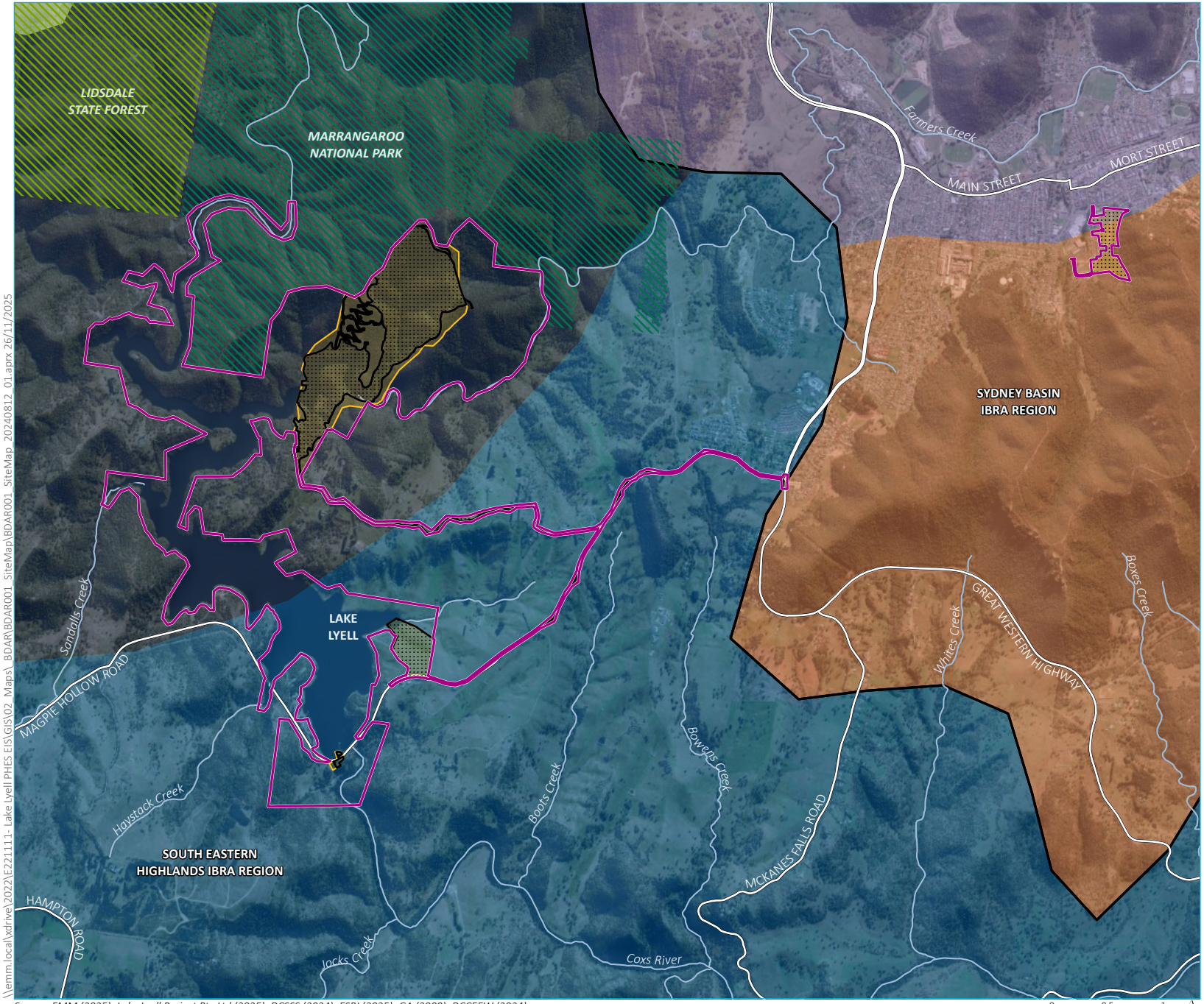
4 Landscape features

The identification of landscape features was undertaken in accordance with chapter 3 of the BAM (DPIE 2020a) and results are summarised within this chapter. The landscape features described in the following sections are summarised in Table 4.1 and shown on Figure 4.1 to Figure 4.6.

Table 4.1 Landscape features

Landscape feature	Description
Landscape assessment area boundary	• 1,500 m buffer of the disturbance footprint (main site and Town camp site) in the Hill End IBRA subregion. • 500 m buffer of the disturbance footprint (access road and Lakeside camp) in the Bathurst IBRA subregion. • 1,500 m buffer of the disturbance footprint (Town camp site) in the Burragorang and Wollemi IBRA subregions.
Interim Biogeographic regionalisation of Australia (IBRA) bioregion	• South Eastern Highlands. • Sydney Basin (Town camp site).
IBRA subregion/s	• Hill End, Bathurst, Burragorang, Wollemi. Extent of IBRA subregions is mapped in Figure 4.2.
BioNet NSW landscapes (formerly Mitchell landscapes)	• Mount Horrible Plateau (majority of the construction envelope). • Bathurst Granites (accommodation camp site and most of Sir Thomas Mitchell Drive upgrade area). • Sydney Basin Western Escarpment (Town camp site). BioNet NSW landscapes are mapped in Figure 4.2.
Rivers, streams and estuaries	<u>Hill End IBRA subregion</u> • Farmers Creek (inundated by existing lake within disturbance footprint. • Coxs River (inundated by existing lake within disturbance footprint). • Collits Swamp Creek (partially inundated by existing lake in landscape assessment area). • Sandalls Creek (inundated by existing lake in landscape assessment area). • Haystack Creek (inundated by existing lake in landscape assessment area). <u>Bathurst IBRA subregion</u> • Collits Swamp Creek (inundated by existing lake within disturbance footprint). • Boots Creek (upper, 1st and 2nd order reaches in landscape assessment area). • Numerous other unnamed, predominantly 1st and 2nd order streams. <u>Burragorang IBRA subregion</u> • Two unnamed 1st streams and one and 2nd order stream in the construction envelope. • Two unnamed, 3rd order streams (outside of construction envelope). • Farmers Creek (4th order) outside of construction envelope. • Other unnamed 1st and 2nd order streams outside of construction envelope. Rivers, streams and estuaries are mapped in Figure 4.3.
Wetlands	No nationally important wetlands within the project area or landscape assessment area.

Landscape feature	Description
Connectivity of different areas of habitat	The upper reservoir area of the construction envelope is surrounded by extensive areas of native forest, including Marrangaroo National Park. The lower area of the project (south of Farmers Creek) is also surrounded by native vegetation, however, in some areas canopy cover is discontinuous due to a history of clearing for agriculture and forestry operations. Most of the road reserve of Sir Thomas Mitchell Drive and Magpie Hollow Road is surrounded by partially-cleared land. See connectivity of habitat mapped in Figure 4.4.
Areas of geological significance and soil hazard	North of Farmers Creek, the construction envelope is located in very steep terrain but does not contain cliffs, large outcrops or deep rock crevices. In adjacent areas, near the summit of Mt Walker, several rock outcrops with deep crevices are found however these areas are not extensive and do not contain any caves or rock overhangs.
Areas of outstanding biodiversity value	No areas of outstanding biodiversity value are located within the project area.
Percent native vegetation cover	• 73% - Hill End IBRA subregion. • 29% - Bathurst IBRA subregion. • 46% - Burragorang and Wollemi IBRA subregions. See extent of native vegetation mapped in Figure 4.2.



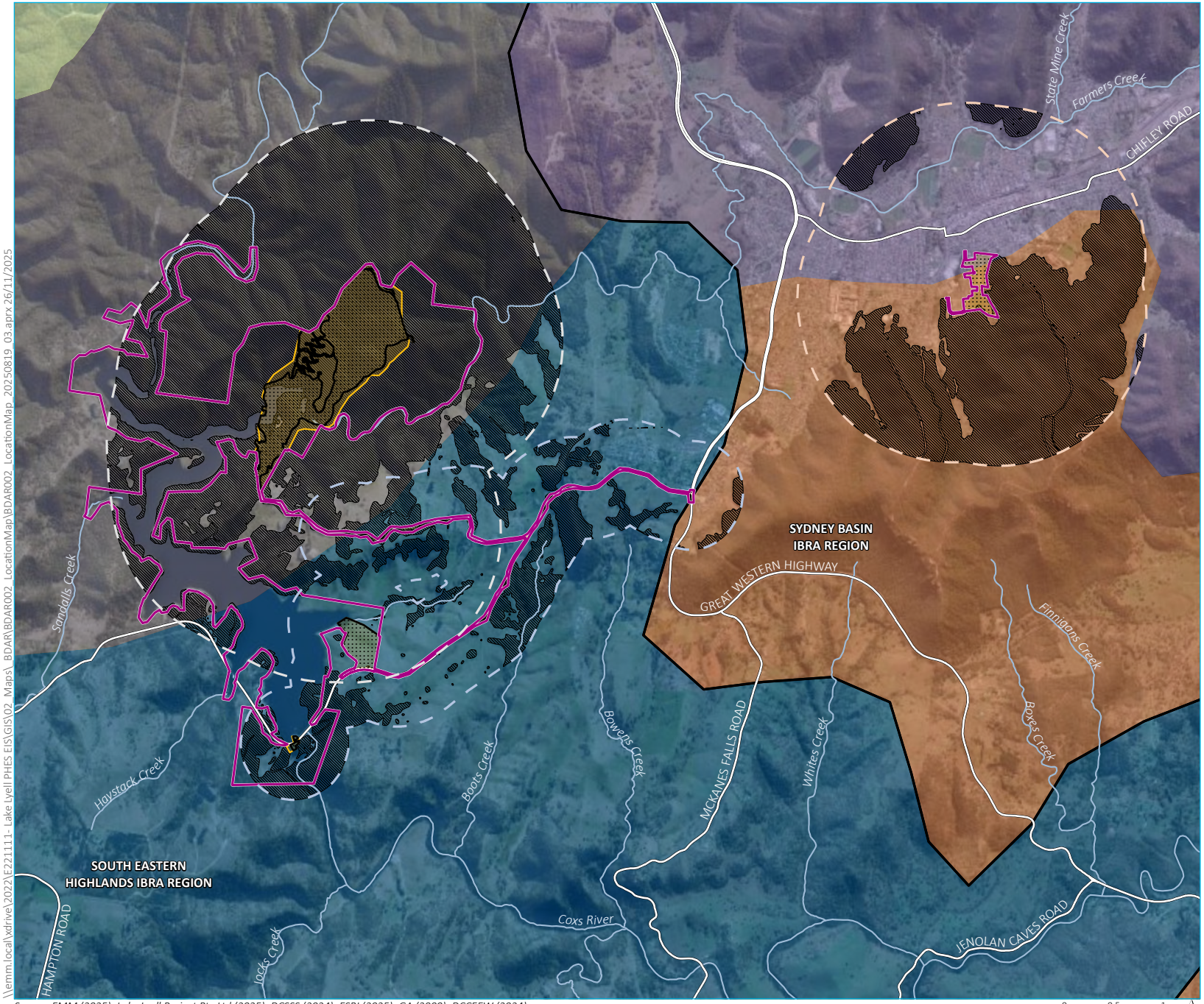
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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

Site map

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 4.1

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KEY

- Project area
- Subject land
- Construction envelope
- Native vegetation
- IBRA region boundary

IBRA subregion

- Bathurst
- Burragorang
- Capertee Uplands
- Hill End
- Wollemi

Landscape assessment buffer

- Bathurst (500 m)
- Hill End (1500 m)
- Wollemi and Burragong (1500 m)

Existing environment

- Major road
- Named watercourse

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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Location map

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 4.2

EMM
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4.1 Landscape features

4.1.1 Bioregions and landscape

The project is primarily located within the South Eastern Highlands and Sydney Basin IBRA regions, with small areas in the location of the Town camp site option located in the Burragorang and Wollemi IBRA subregions of the Sydney Basin IBRA region.

The PHES area and most of the broader construction envelope are located within the Hill End IBRA subregion. The southern part of the construction envelope, including parts of the Sir Thomas Mitchell Drive upgrade and the accommodation camp site, is located in the Bathurst IBRA subregion (refer to Figure 4.1).

The buffer area occurs across two BioNet NSW Landscapes (formerly Mitchell Landscapes) (refer to Figure 4.2):

- Mount Horrible Plateau
- Bathurst Granites
- Sydney Basin Western Escarpment.

The main part of the construction envelope is located entirely within the Mount Horrible Plateau BioNet NSW Landscape; this was the landscape used in this assessment for areas within the Hill End IBRA subregion.

The Lakeside camp site and most of Sir Thomas Mitchell Drive upgrade area are located within the Mount Bathurst Granites BioNet NSW Landscape; this was the landscape used in this assessment for areas within the Bathurst IBRA subregion.

The Town camp site is located within the Sydney Basin Western Escarpment; this was the landscape used in this assessment for areas within the Burragorang and Wollemi IBRA subregions.

4.1.2 Rivers, streams, estuaries and wetlands

The project area is located within the upper section of the Coxs River catchment, which sits within the broader Hawkesbury-Nepean catchment. The Coxs River catchment covers 1,450 square kilometres (km^2) and ultimately flows into the northern arm of Lake Burragorang (also known as Warragamba Dam).

Farmers Creek, a tributary of the Coxs River is the key waterway within the project area. Within the construction envelope, Farmers Creek is a highly modified waterway, consisting of an arm of the artificial reservoir of Lake Lyell (refer to Figure 4.3 and Photograph 4.1).

The affected section of Farmers Creek is a permanently inundated waterway which has a substratum containing a mixture of rock and silt, with very little emergent aquatic vegetation. Upstream of the construction envelope, the riparian zone of Farmers Creek is well-vegetated and surrounded by native woodland and forest.

The smaller streams (1st to 3rd order) within the construction envelope are gullies that lack distinctive riparian vegetation, flowing only ephemerally during and shortly after wet weather events and contain small temporary pools (refer Photograph 4.2).

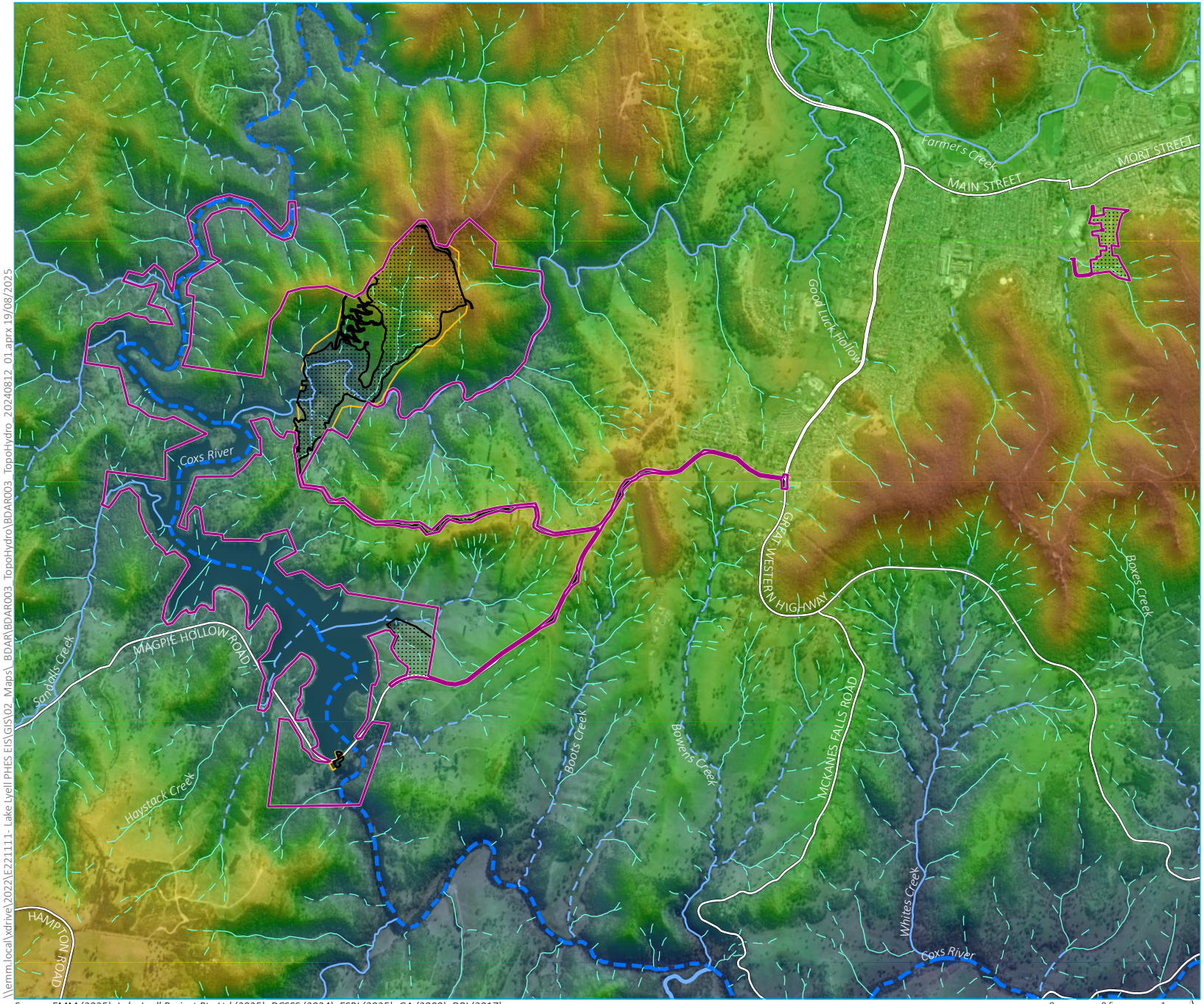
The buffer area and broader locality do not contain any state significant wetlands, nationally important wetlands or Ramsar wetlands.



Photograph 4.1 Example of typical edge habitat of Lake Lyell (Farmers Creek) with steep edges and minimal emergent aquatic vegetation



Photograph 4.2 Example of a small pool in an ephemeral stream in the project area



KEY

- Project area
- Subject land
- Construction envelope

Existing environment

- Major road

Strahler stream order

- 1st order
- 2nd order
- 3rd order
- 4th order
- 5th order
- 6th order

Elevation (m)

1289

578

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DPI (2017)

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Topography and hydrology

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 4.3

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4.1.3 Connectivity

The construction envelope is bordered by patches of intact native forest to the north and south, however historical clearing has fragmented the landscape to the west and particularly east of Lake Lyell. Around the PHES area and upper reaches of the Coxs River, native forest is largely intact and contiguous with Marangaroo National Park. To the south, the construction envelope is connected to a heavily vegetated riparian corridor along the Coxs River. Alongside the lake itself, canopy cover is variable or absent owing to prior clearing, most likely for agriculture, recreation reserves and dam-related infrastructure. More distant to the east and west of the site, patchy forest transitions into a heavily cleared agricultural landscape.

The access road (Sir Thomas Mitchell Drive) is largely surrounded by a corridor of highly disturbed to partially intact native vegetation within the public road reserve. In the adjacent private landholdings, native vegetation cover is patchy with large areas cleared of native woody vegetation or heavily thinned. A moderate level of habitat connectivity remains in these areas.

There is no structurally or floristically intact native vegetation in the Lakeside camp site nor in the Town camp site. Relatively intact vegetation is located in adjacent lands.

Indicative wildlife movement corridors, connecting larger areas of relatively intact native vegetation in the locality, are shown in Figure 4.4.

4.1.4 Areas of geological significance

Most of the construction envelope is mapped as the Lambie Group geology unit, described as terrigenous to shallow marine, quartz sandstone, quartzite, siltstone, mudstone, and conglomerate. Sandstone or conglomerate was not observed in the project area, however finer-grained sedimentary (reddish mudstone and siltstone) and metasedimentary rock (pale to dark-coloured quartzite) was observed in track cuttings and exposed surface rock (refer to Figure 4.5).

Southern parts of the construction envelope, including the access road and accommodation camp site options, are mapped as the Bathurst Suite geology unit, described as granites and monzogranite. Field observations were consistent with the mapped geology in the accommodation camp area, and along most of the access road. However, it appears that the transition from Lambie Group to Bathurst Suite geology is located further south than indicated in the broad scale geology mapping for the locality.

The upper reservoir section of the construction envelope is located in very steep terrain but does not contain cliffs, large outcrops or deep rock crevices. In adjacent areas, near the summit of Mt Walker, several rock outcrops with deep crevices are found however these areas are not extensive and do not contain any caves or rock overhangs (refer Photograph 4.3).

The lower part of the construction envelope, south of Farmers Creek and the site access road (Sir Thomas Mitchell Drive) are on moderately steep terrain. These areas do not contain any cliffs or large rock outcrops.

There are no karst areas (i.e. limestone cave systems) or sandstone cliff areas known from the adjacent lands that would be likely to contain substantial caves.



Photograph 4.3 **Rocky habitat near the project area in Marrangaroo National Park**

4.1.5 Soil landscapes

The soil landscapes are mapped in the project area in the Soil Landscapes of Central and Eastern NSW - v3.0.1 (Department of Climate Change, Energy, the Environment and Water 2024) are shown in Figure 4.6 and described in Table 4.2. Soil fertility is low to very low in all mapped landscapes.

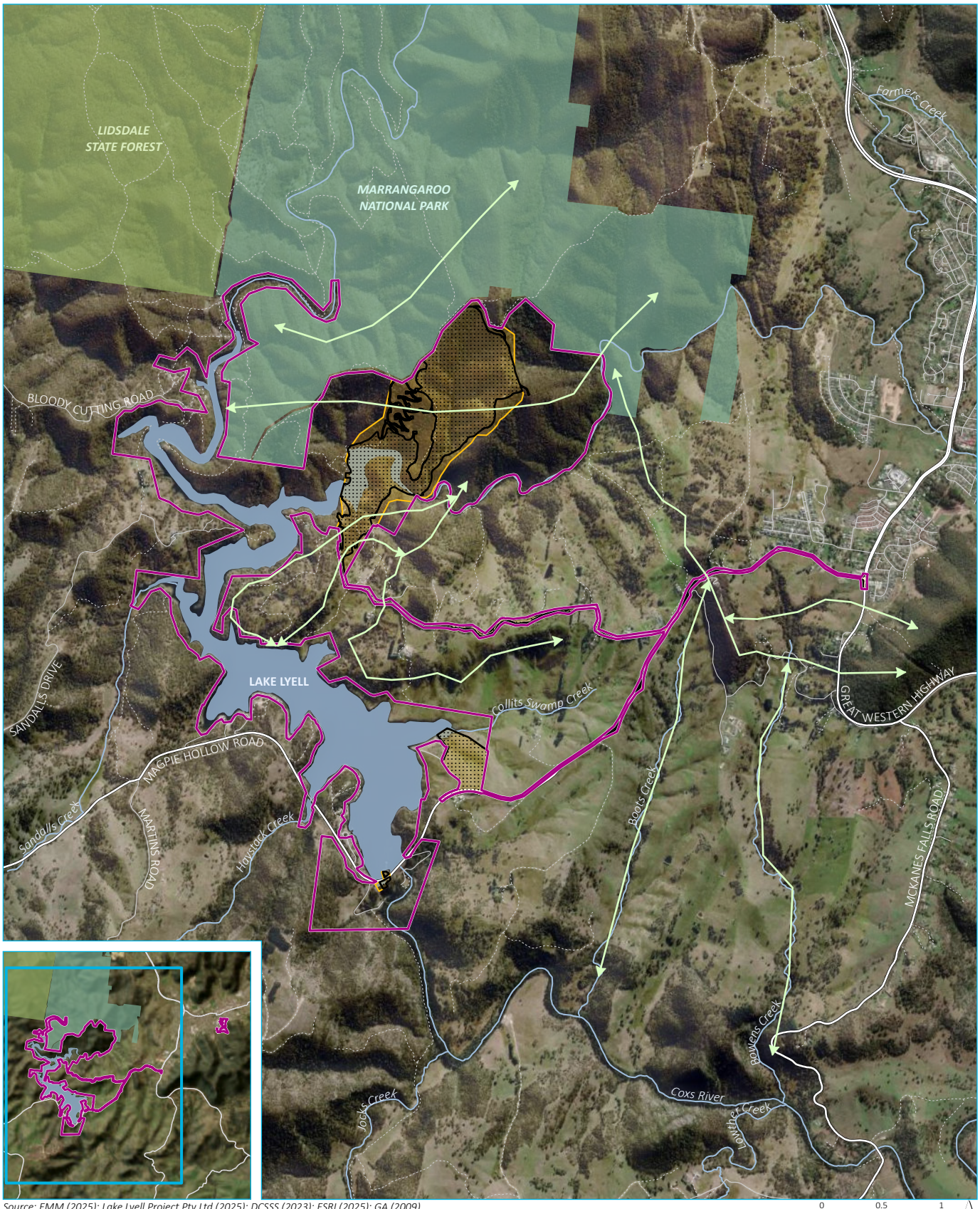
Table 4.2 Modelled plant community types in the project area

Map code	Landscape name	Geology	Soils	Soil fertility
rm	Round Mount	Granite and occasional adamellite and small areas of Lambie Group sediments (principally quartzite) are also found.	Brownish black loamy sand (topsoil) Dull brown sand (topsoil or subsoil) Bright brown clayey sand (subsoil)	Soil material fertility is low to very low. Soil materials are typically sodic with low to very low exchangeable cations and low to very low phosphorus. Soils range from very strongly to slightly acid with low to very low expected pH buffering capacity. Plant available water-holding capacities are characteristically low to very low. Some nitrogen and elemental sulphur fertilisers used extensively on parts of this landscape for pasture improvement have an acidifying effect on the soil.
mw	Mount Walker	Lambie Group of metasediments—massive white quartzites, shales, siltstones, sandstones, impure limestones, claystones and conglomerates.	Earthy brown loam (topsoil) Weakly pedal reddish brown silty clay loam (subsoil) Dull yellow orange bleached fine sandy loam (topsoil)	Soil material fertility is very low. Generally soil materials are stony, strongly acidic with low to very low cation exchange capacity (CEC), very low available phosphorus, low nutrient storage potential, low to moderate expected pH buffering capacity, and high potential aluminium toxicity. Moderate soil depths on some midslopes and lower slopes allow for some deep root penetration.
mr	Marrangaroo	Coarse-grained pink porphyritic granites and adamellites to coarse-grained granodiorite.	Gritty brown loamy sand (topsoil) Bright yellowish brown clayey sand (topsoil) Strongly weathered granite (subsoil) Mottled bright yellowish-brown clay (subsoil) Organic sandy loam (topsoil) Pedal dark brown silty clay (subsoil)	Fertility of soil materials is low. Soil materials have very low available phosphorus, very low to low CEC and may be waterlogged in poorly drained areas. All materials are acid and generally have low water-holding capacities. Tree root development may be inhibited by shallow soils and poorly structured soils and high watertables in swampy drainage depressions.

Map code	Landscape name	Geology	Soils	Soil fertility
cb	Cullen Bullen	Shale and sandstone in addition to conglomerate, limestone. Grey siltstone with thin beds of limestone and sandstone.	Dark reddish brown sandy clay loam (topsoil) Hardsetting bleached massive fine sandy clay loam (topsoil) Bright brown moderately pedal clay (subsoil)	Topsoil fertility is low with low to very low nutrient status, moderate to low expected pH buffering capacity, low nutrient storage capacity and low available water-holding capacity. Some localised high organic matter. Subsoil material in areas containing dark reddish brown sandy clay loam has moderate CEC and very high nutrient storage capacity and very high expected pH buffering capacity; however, it has very high potential aluminium toxicity. Areas of hardsetting bleached massive fine sandy clay loam area strongly sodic. General fertility is low. Deep root development for plants may be limited by locally shallow soils. Seed germination and establishment may be limited by hardsetting surface horizons.
gb	Ganbenang	coarse-grained pink granites and adamellites with subdominant granodiorites. Deeply weathered saprolite several metres deep is typical.	Brownish black sandy clay (topsoil) Brownish black massive sandy loam (topsoil) Massive brownish grey clayey sand Bright yellowish brown pedal sandy clay (subsoil)	Soil material fertility is low to very low. Topsoils sometimes contain moderate to high levels of organic matter, are moderately to strongly acid with low to very low cation exchange capacity. Sand and sandy clay soils have very low organic matter and are occasionally slightly alkaline with a low to very low CEC. Plant available water-holding capacity is moderate to low. Soils are subject to seasonal waterlogging which limits soil volume available for root penetration.

4.1.6 Areas of outstanding biodiversity value

There are no areas of outstanding biodiversity value, as declared by the NSW Minister for Environment and Heritage, within the project area.



Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); ESRI (2025); GA (2009)

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KEY

- Project area
- Subject land
- Construction envelope
- Indicative wildlife movement corridor

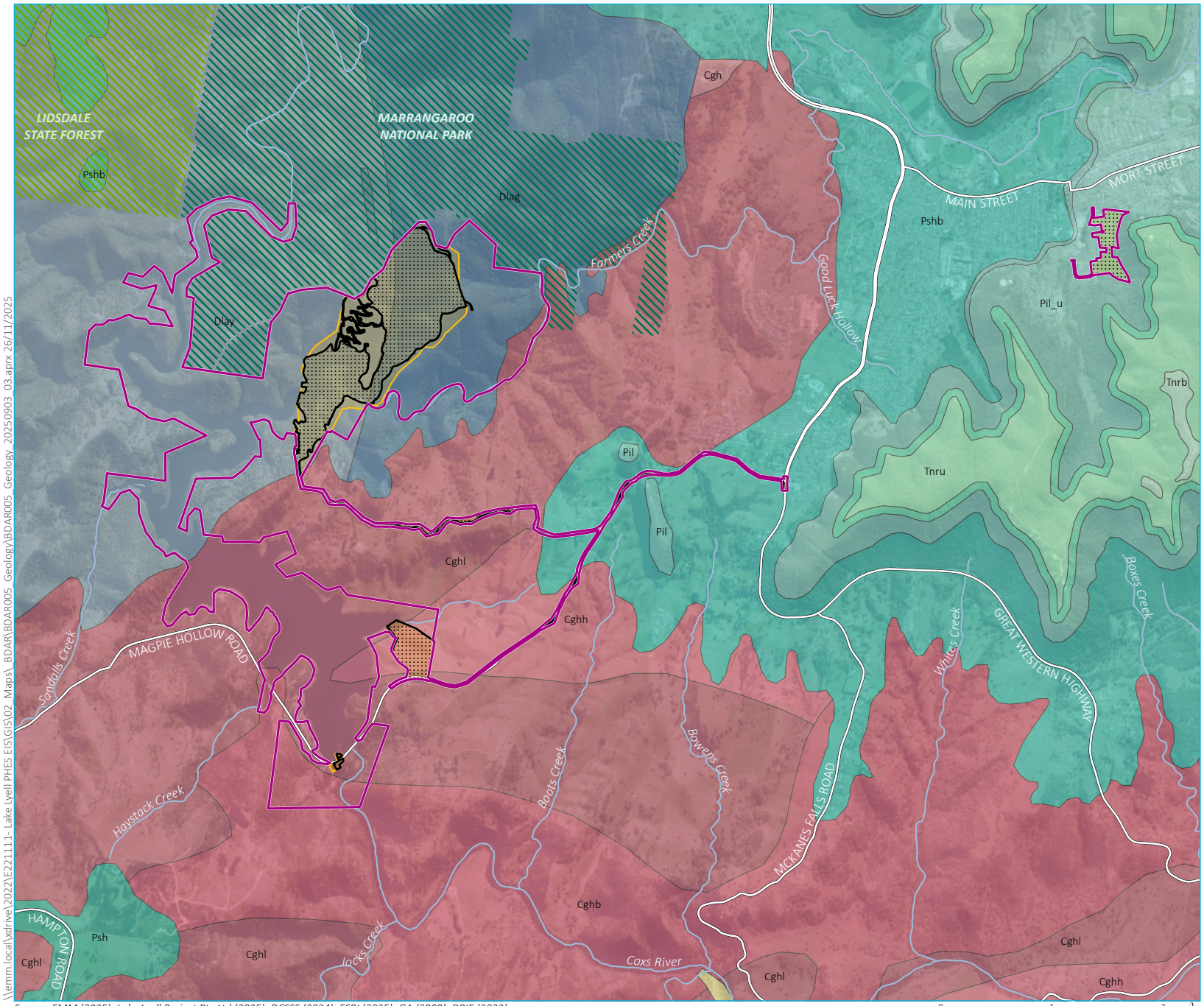
Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Connectivity

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 4.4

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KEY

- Project area
- Subject land
- Construction envelope

Seamless geology

Cenozoic Sedimentary Province

- Q_a | Alluvium

Permo-Triassic Basins

- Pil | Illawarra Coal Measures
- Pil_u | Cullen Bullen Subgroup
- Pibm | Marrangaroo Formation
- Psh | Shoalhaven Group
- Pshb | Berry Siltstone
- Tnrb | Banks Wall Sandstone
- Tnru | Burra-Moko Head Sandstone
- Tnac | Caley Formation

Lachlan Orogen

- Cgh | Hartley Suite
- Cghh | Hartley Granodiorite
- Cghl | Lett Granite
- Cghb | Blaxland Granite
- Dlag | Gibbons Creek Sandstone
- Dlas | Slowmans Creek Conglomerate
- Dlay | Rydal Formation

Existing environment

- Major road
- Named watercourse
- NPWS reserve
- State forest

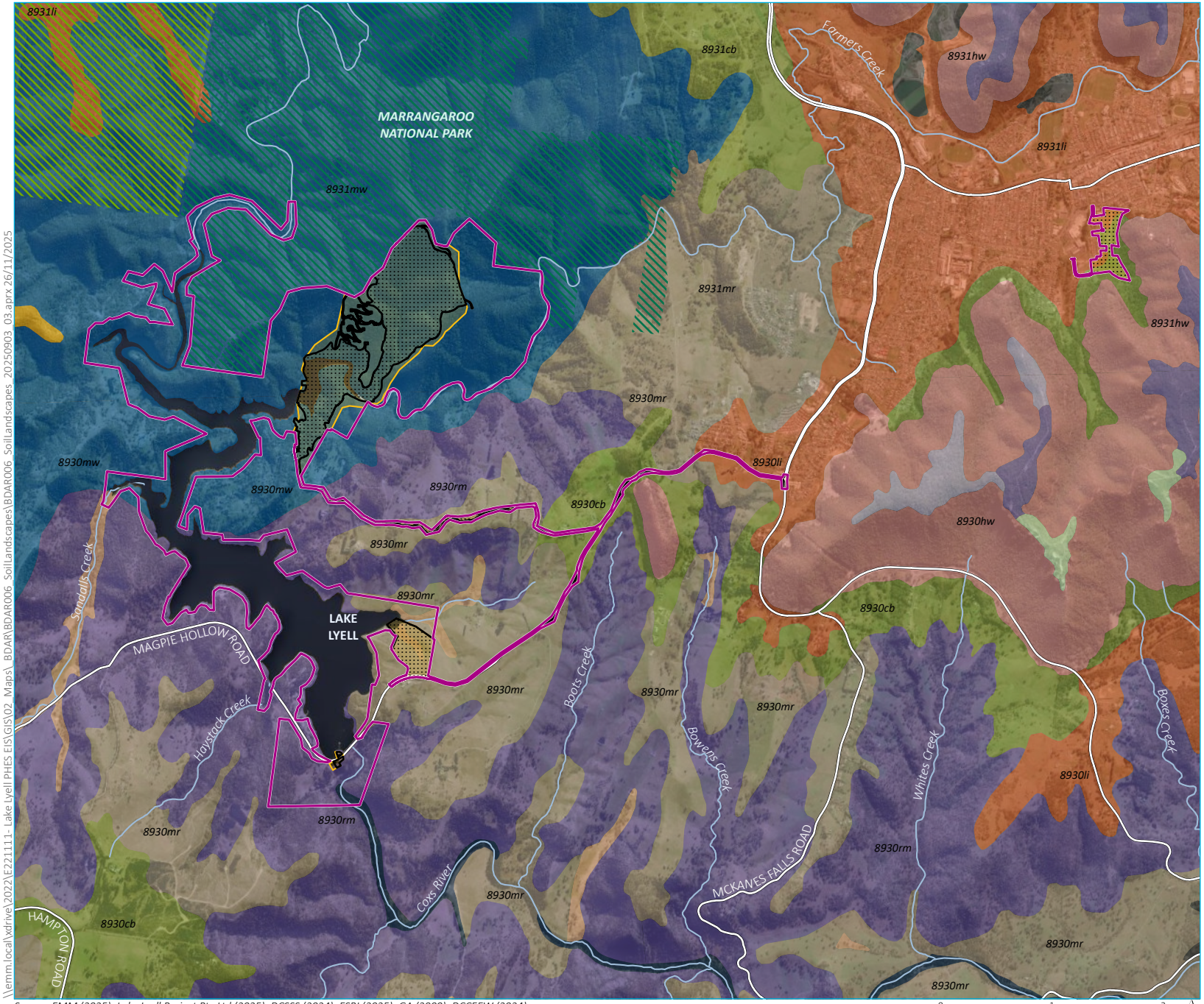
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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DPIE (2023)

Geology

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 4.5

EMM
creating opportunities



KEY

- Project area
- Subject land
- Construction envelope

Existing environment

- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest

Soil landscape

- Coxs River (8930cx)
- Cullen Bullen (8930cb, 8931cb)
- Disturbed Terrain(8930xx, 8931xx)
- Ganbenang (8930gb)
- Hassans Walls (8930hw, 8931hw)
- Lithgow (8930li, 8931li)
- Marrangaroo (8930mr, 8931mr)
- Medlow Bath (8930mb, 8931mb)
- Mount Sinai (8930ms)
- Mount Walker 8930mw, 8931mw)
- Round Mount (8930rm)
- Rydal (8931ry)
- Wollangambe (8931wo, 8931wo)

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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Soil landscapes

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 4.6

EMM
creating opportunities

4.2 Assessment of site context

The construction envelope context has been assessed in accordance with the BAM (2020).

The percentage of native vegetation cover was calculated using:

- a 1,500 m buffer around the disturbance footprint within the Hill End IBRA subregion
- a 1,500 m buffer around the disturbance footprint within the Burragorang and Wollemi IBRA subregions (Town camp) – a combined area was used due to the small amount of the project area within the Wollemi subregion
- a 500 m buffer around the disturbance footprint in the Bathurst IBRA subregion (access road and accommodation camp), accounting for the linear study area of the access road and the lack of structurally intact native vegetation in the accommodation camp site.

These buffered areas are referred to in this BDAR as landscape assessment area.

Mapping of native vegetation within the landscape assessment area was undertaken using vegetation mapping collected as a part of surveys, aerial mapping interpretation and spatial data from State Vegetation Type Map (NSW DCCEEW 2022a). Area of native vegetation by IBRA subregions is shown in.

Table 4.3 Percentage of native vegetation cover

IBRA subregion	Native vegetation in landscape assessment area (ha)	Landscape assessment area (ha)	Percentage of native vegetation in landscape assessment area
Hill End	1,427	1,945	73%
Bathurst	139	484	29%
Burragorang and Wollemi	487	1,048	46%

5 Native vegetation

5.1 Background review

A spatial analysis of existing vegetation mapping information was undertaken to determine which plant community types (PCTs) are modelled to occur within the construction envelope and landscape assessment area in the SVTM (NSW DCCEEW 2022a). Twenty-three PCTs are mapped within the landscape assessment area in the SVTM of which eleven were modelled to occur in the construction envelope, whilst 23 are modelled in the landscape assessment area. These are listed in Table 5.1.

Table 5.1 Modelled plant community types in the construction envelope and landscape assessment area

PCT ID	PCT name	Modelled in construction envelope	Modelled in landscape assessment area
3211	Central Tableland Montane Wet Forest	No	Yes
3226	Western Blue Mountains Montane Wet Fern Forest	Yes	Yes
3303	Central Tableland Ribbon Gum Sheltered Forest	No	Yes
3347	Southern Tableland Creekflat Ribbon Gum Forest	Yes	Yes
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	No	Yes
3367	Central Tableland Granites Grassy Box Woodland	Yes	Yes
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	Yes	Yes
3376	Southern Tableland Grassy Box Woodland	Yes	Yes
3385	Southern Tableland Creekflat Swamp Woodland	No	Yes
3510	Capertee Slopes Stringybark-Box Forest	No	Yes
3534	Central West Stony Hills Stringybark-Box Forest	Yes	Yes
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	Yes	Yes
3687	Newnes Plateau Peppermint-Ash Tall Forest	Yes	Yes
3688	Newnes Plateau Silvertop Ash Woodland	No	Yes
3694	Upper Blue Mountains Ridgetop Woodland	No	Yes
3695	Western Blue Mountains Peppermint Sheltered Forest	No	Yes
3735	Central Tableland Peppermint Shrub-Grass Forest	Yes	Yes
3738	Goulburn-Lithgow Tableland Hills Grassy Forest	No	Yes
3747	Southern Tableland Western Hills Scribbly Gum Forest	Yes	Yes
3862	Newnes Plateau Rockplate Heath	No	Yes
3863	Upper Blue Mountains Mallee Heath	No	Yes
3865	Western Blue Mountains Pagoda Scrub	No	Yes
3946	Newnes Plateau Swamp Woodland	Yes	Yes

5.2 Detailed vegetation mapping and habitat assessment

Rapid vegetation assessments (RVAs) were undertaken throughout the construction envelope during vegetation mapping surveys where the dominant plant species was recorded at each point location. This site inspection focused on dominant canopy, mid-storey and groundcover species and vegetation structure.

Detailed vegetation integrity surveys (BAM Plots) were used in conjunction with RVA data to identify and map the PCTs present. Plant community distribution and condition data was collected in the field using GPS-enabled devices using Fieldmaps for ArcGIS™.

PCTs were stratified into vegetation zones based on broad condition state using the definitions in Table 5.2. Vegetation zones were distinguished largely by presence or absence of woody native vegetation, tree canopy maturity and native versus exotic species abundance and diversity.

Table 5.2 Definitions used in delineation of vegetation zones and unvegetated areas

Condition class	Description
High	Largely intact with all strata present and minimal disturbance.
Moderate	Some elements or strata affected by factors such as partial-clearing, historical agricultural and/or forestry operations, disturbance from feral animals and the intrusion of exotic plant species.
Derived Shrubland (DS)	Tree stratum missing or reduced to young regrowth. Native vegetation largely restricted to shrub layer and groundcover, dominated by a combination of shrubs, native grasses, grass-like plants and forbs. Some areas may have a sparse small regrowth tree layer. Exotic vegetation present but not dominant.
Derived native grassland (DNG)	Tree stratum missing. Native vegetation restricted to groundcover, dominated by a moderate to high diversity of native grasses, grass-like plants and forbs. Some areas may have a sparse shrub layer. Exotic vegetation present but not dominant.
Poor condition derived native grassland (DNG_Poor)	Tree and shrub strata missing. Native vegetation restricted to groundcover, containing a low diversity of native grasses, grass-like plants and forbs. Exotic species abundant and may be co-dominant or locally dominant. Some areas may contain scattered shrubs.
Poor	Tree stratum present, but understorey vegetation is absent or highly degraded due to exotic understorey dominance and/or intensive soil disturbance.
Derived exotic grassland and/or herbfield (DEGH)	Native tree and shrub strata missing. Ground layer dominated by exotic plants with a very low diversity and abundance of native species. Some areas may contain scattered shrubs.
Exotic	Planted and/or self-sown exotic trees with only a very low cover and abundance of native species. Understorey and ground layer absent, sparse and dominated by exotic plant species.
Unvegetated	Paved and/or gravel roads, vehicle tracks, and other areas of bare ground, concrete, tarmac or other artificial surfaces. These areas were not assessed for ecosystem credits.
Sedge	Derived, predominantly native sedgeland. Tree stratum missing. Native vegetation restricted to groundcover, dominated by a sedges with a low cover of native grasses, grass-like plants and forbs. Exotic vegetation present but not dominant. Some areas may contain scattered shrubs.
Water body	Still, open water with very little or no floating or emergent aquatic vegetation formed through the artificial damming of one or more waterways.

5.2.1 Vegetation integrity assessment

Following the stratification of vegetation zones within the construction envelope, vegetation integrity of native vegetation was assessed using data obtained via a series of plots, as per the methodology outlined in sections 4.2.1, 4.3.3 and 4.3.4 of the BAM (DPIE 2020a).

Plot data was collected in August and November 2023, June to July 2024 and January to March 2025.

At each plot location the following was undertaken:

- one 20 m x 20 m plot (or equivalent area for linear patches) for assessment of composition and structure
- one 20 m x 50 m plot (or equivalent area for linear patches) for assessment of function, including a series of five 1 m x 1 m subplots to assess average leaf litter cover.

The assessment of composition and structure is based on a 20 m x 20 m plot, recorded species name, stratum, growth form, cover and abundance rating for each species present within the plot. Cover (foliage cover) was estimated for all species rooted in or overhanging the plot, and recorded using decimals (if less than 1%, rounded to whole number (1 to 5%) or estimated to the nearest 5% (5 to 100%). Abundance was counted (up to 20) and estimated above 20, and recorded using the following intervals: 1, 2, 3, 4, 5, 10, 20, 50, 100, 500, 1,000, 1,500, 2,000, etc.

Function was assessed by recording the number of large trees, the presence of tree stem size class, tree regeneration, number of trees with hollows and length of fallen logs with the 20 m x 50 m plot, as well as leaf litter cover within five 1 m x 1 m subplots nested within the 20 m x 50 m plot.

In total, 35 plots were conducted to inform this assessment. The minimum number of plots and transects per vegetation zone was met where possible in accordance with Table 3 of the BAM (DPIE 2020a). The number of plots surveyed in each vegetation zone for early works, separated by IBRA subregion, is shown in Table 5.3 to Table 5.5. Table 5.6 shows the number of plots surveyed in each vegetation zone for Main Works, which are all within the Hill End IBRA Subregion. Compiled plot data is Appendix A.

The plot surveys were conducted prior to the final design of the project. This was to inform the design and avoid and minimise impacts where possible (refer to Section 8.3). For this reason, some plots are located outside of, but within proximity to, the construction envelope. Despite falling outside of the final design of the construction envelope, these plots are considered representative and have been used to inform the stratification of management zones within the construction envelope and vegetation integrity assessment.

Surveys for flora and vegetation communities were completed under the authority of Scientific License (SL100409). A list of flora species was compiled for each plot and PCT (see Appendix A). Records of all flora species will be submitted to CHPR for incorporation into the BioNet Atlas of NSW Wildlife.

Rainfall data for the 12 months preceding each of the surveys is not available for weather stations within 35 km of the construction envelope. However, the years preceding the surveys generally saw near average rainfall conditions between the end of the 2020 to 2023 La Niña event, in late 2023 and the below average rainfall conditions that commenced in mid-2025 (BOM 2025). The average rainfall benchmarks (default) were therefore considered the most suitable for use in the assessment and were therefore adopted in the BAM-C.

Table 5.3 Vegetation plot requirements for the Hill End IBRA Sub-region area of the early works disturbance footprint

PCT ID	PCT name	Vegetation zone name	Extent in disturbance footprint (ha)	Minimum number of plots required per vegetation zone	Number of plots undertaken
3211	Central Tableland Montane Wet Forest	3211_Moderate	0.48	1	4 (LL04, LL12, LL13, LL14)
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_DEGH	0.32	1	1 (LL05-06-24)
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	3348_Moderate	0.18	1	3 (LL_STM_02, LLAR03, LLAR04)[1]
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	1.50	1	4 (LL_250724, LL06-06-24, LLAR01, LLAR02)
		3367_DS	0.10	1	1 (LLShrub01)
		3367_Poor	0.17	1	2 (LL03-06-24, LLPoor01)
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	3369_Moderate	1.20	1	4 (LL01, LL01-06-24, LL02-06-24, LL09)
3385	Southern Tableland Creekflat Swamp Woodland	3385_Poor	0.36	1	1 (PE01)
		3385_DNG	0.25	1	1 (PE02)
		3385_DEGH	2.11	2	1 (PE03)[2]
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_High	0.19	1	3 (LL15, LL16, LL18)
3687	Newnes Plateau Peppermint-Ash Tall Forest	3687_Poor	0.05	1	1 (PE01)[1]
		3687_DNG_Poor	0.03	1	1 (PE02)[1]
		3687_DEGH	8.85	3	2 (PE04, PE05)[3]
3735	Central Tableland Peppermint Shrub-Grass Forest	3735_High	2.23	2	4 (LL03, LL05, LL07, LL04-06-24)
3747	Southern Tableland Western Hills Scribbly Gum Forest	3747_High	1.05	1	3 (LL02, LL06, LL11)
0	-	Unvegetated	0.68	0	0
1	-	Water body	0.70	0	0

Notes:

1. Due to the very small size of these vegetation zones (<0.1 ha, i.e. less than the size of a BAM plot), data from the nearest plot in a vegetation zone of similar condition was utilised.
2. As this vegetation zone is in very poor condition, is relatively homogenous, and only slightly exceeds the 2-ha limit for a zone requiring only a single plot, a second plot is not considered to be necessary and the data from the single plot was duplicated in the BAM-C; due to the presence of scattered shrubs and saplings in this zone at very low density, the data for the duplicated plot was altered slightly to include these attributes.

3. As this vegetation zone is in very poor condition, is located on fill material, is relatively homogenous, and only slightly exceeds the 5-ha limit for a zone requiring only a two plots, a third plot is not considered to be necessary and the data from a plot was duplicated in the BAM-C.; ; due to the presence of scattered shrubs and saplings in this zone at very low density, the data for the duplicated plot was altered slightly to include these attributes.

Table 5.4 Vegetation plot requirements for the Bathurst IBRA Subregion area of the early works disturbance footprint

PCT ID	PCT name	Vegetation zone name	Extent in disturbance footprint (ha)	Minimum number of plots required per vegetation zone	Number of plots undertaken
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_Sedge	0.75	1	1 (LLC01)
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	3348_Moderate	2.94	2	3 (LL_STM_02, LLAR03, LLAR04)
		3348_DNG	0.13	1	2 (MHR02, MGR07)
		3348_DEGH	2.94	2	4 (LLAR05, Mhr05, MHR05, MHR06, MHR08)
		3348_Exotic	0.17	1	1 (LLAR06)
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	0.11	1	1 (LLAR01)
		3367_DNG_Poor	10.88	3	3 (LL_Camp02 LL_Camp03, LL_Camp05)
		3367_DEGH	1.30	1	1 (LL_Camp04)
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_Moderate	0.05	1	1 (MHR01)
0	-	Unvegetated	6.23	0	0
1	-	Water body	1.01	0	0

Notes:

1. Due to the very small area of the vegetation zone in this IBRA subregion, the nearest plot from an area of similar to better condition (approximately 1 km away) from the adjacent IBRA subregion was utilised.

Table 5.5 Vegetation plot requirements for the Burragorang IBRA Subregion and Wollemi IBRA Subregion areas of the early works disturbance footprint

PCT ID	PCT name	Vegetation zone name	Extent in disturbance footprint (ha) Burragorang	Extent in disturbance footprint (ha) Wollemi	Minimum number of plots required per vegetation zone	Number of plots undertaken
3385	Southern Tableland Creekflat Swamp Woodland	3385_Poor	0.36	-	1	1 (PE01)
		3385_DNG	0.25	-	1	1 (PE02)
		3385_DEGH	2.11	-	2	1 (PE03)
3687	Newnes Plateau Peppermint-Ash Tall Forest	3687_Poor	-	0.05	1	#
		3687_DNG_Poor	-	0.03	1	#
		3687_DEGH	5.97	2.88	3	2 (PE04, PE05)
0	-	Unvegetated	0.76	0.15	0	0

Note: # indicates that due to the very small size of the zone (<0.1 ha, i.e. the size of a BAM plot) surrogate plot data from an adjacent zone, within 1 km, in similar condition was utilised.

Table 5.6 Vegetation plot requirements within the main works disturbance footprint (all within the Hill End IBRA Subregion)

PCT ID	PCT name	Vegetation zone name	Extent in disturbance footprint (ha)	Minimum number of plots required per vegetation zone	Number of plots undertaken
3211	Central Tableland Montane Wet Forest	3211_Moderate	6.82	3	4 (LL04, LL12, LL13, LL14)
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_DEGH	0.36	1	1 (LL05-06-24)
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	5.60	3	4 (LL_250724, LL06-06-24, LLAR01, LLAR02)
		3367_DS	0.71	1	1 (LLShrub01)
		3367_Poor	3.92	2	2 (LL03-06-24, LLPoor01)
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	3369_Moderate	24.84	4	4 (LL01, LL01-06-24, LL02-06-24, LL09)
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_High	8.57	3	3 (LL15, LL16, LL18)
3735	Central Tableland Peppermint Shrub-Grass Forest	3735_High	33.26	4	4 (LL03, LL05, LL07, LL04-06-24)

PCT ID	PCT name	Vegetation zone name	Extent in disturbance footprint (ha)	Minimum number of plots required per vegetation zone	Number of plots undertaken
3747	Southern Tableland Western Hills Scribbly Gum Forest	3747_High	6.94	3	3 (LL02, LL06, LL11)
0	-	Unvegetated	0.04	0	0
1	-	Water body	9.42	0	0

5.3 Results

5.3.1 General vegetation description

The vegetation within the construction envelope reflects past agricultural activity (livestock grazing) and other disturbances such as road construction and damage by feral animals, particularly pigs.

Most of the vegetation within the construction envelope occurs as mid-height to tall open eucalypt forests and woodlands with scattered shrubs and a mixed ground layer of grasses and herbs. Areas of taller forest in more protected areas with deeper soil and higher soil moisture contain a sparse to dense sub-canopy layer of *Acacia falciformis* (Broad-leaved Hickory) with soft-leaved herbs dominating the ground layer. In more exposed areas the ground layer is dominated by grasses, graminoid herbs, hard-leaved forbs and subshrubs. In one location, within the construction envelope of the upper reservoir, a dense sub-canopy of *Allocasuarina littoralis* (Black Sheoak) is present over an area of approximately 4 ha.

Vegetation in the lower elevations to the south of Farmers Creek primarily consists of open forest to woodland dominated by a mix of *Eucalyptus bridgesiana*, *Eucalyptus rubida*, *Eucalyptus melliodora* and *Eucalyptus dives*, with *Eucalyptus pauciflora* and *Eucalyptus viminalis* also occurring in more protected gullies and lower slopes.

Vegetation to the north-east of Farmers Creek varies with aspect, sun exposure and elevation. In some drier, more exposed areas with shallower soil, particularly ridgetops and west-facing slopes, *Eucalyptus rossii* is dominant, with a variety of other eucalypts occurring at lower density. In similar but slightly less exposed areas in the north of the construction envelope, vegetation is similar in composition but dominated by *Eucalyptus sieberi* occurs.

On more protected slopes mid-height to tall woodland and open forest occurs, which is dominated by *Eucalyptus dives*, *Eucalyptus viminalis*, *Eucalyptus pauciflora*, and *Eucalyptus rubida* and a sub-canopy of *Acacia falciformis*. In the far north of the construction envelope, a tall to very tall forest occurs, which is dominated by *Eucalyptus fastigata* with occasional *Eucalyptus viminalis*, *Eucalyptus rubida* and *Eucalyptus dives*.

On hillsides that are neither very exposed nor in protected gullies, a mid-height forest of *Eucalyptus dives*, *Eucalyptus rubida* and *Eucalyptus bridgesiana* dominates.

Much of the drier vegetation of the construction envelope remains intact with minimal weed disturbance. However, roadsides, moister areas and areas with higher soil fertility contain a variety of exotic forbs and grasses that often make up a large proportion of the ground layer. There are also fairly extensive areas with a dense understorey of *Rubus fruticosus* species complex (Blackberry) in gullies and adjacent slopes to the south of Farmers Creek.

The proposed Lake Lyell construction camp site is cleared, highly modified and dominated by poor condition mixed native and exotic grassland.

The Town camp site is largely cleared, highly modified and dominated by poor condition mixed native and exotic grassland, growing on imported fill material. It also contains small patches of derived native grassland and poor condition woodland.

Of the exotic species recorded during surveys, 24 are high threat weeds which are:

- *Acetosa sagittata* (Rambling Dock)
- *Acetosella vulgaris* (Sheep Sorrel)
- *Agrostis capillaris* (Browntop Bent)
- *Axonopus fissifolius* (Narrow-leafed Carpet Grass)
- *Cenchrus clandestinus* (Kikuyu Grass)
- *Cotoneaste*r spp (Cotoneaster)
- *Crataegus monogyna* (Hawthorn)
- *Cyperus eragrostis* (Umbrella Sedge)
- *Cytisus scoparius subsp. scoparius* (English Broom)
- *Eragrostis curvula* (African Lovegrass)
- *Genista monspessulana* (Montpellier Broom)
- *Hypericum perforatum* (St. Johns Wort)
- *Ligustrum sinense* (Small-leaved Privet)
- *Nassella trichotoma* (Serrated Tussock)
- *Paspalum dilatatum* (Paspalum)
- *Pinus radiata* (Radiata Pine)
- *Pyracantha* spp. (Firethorn)
- *Ranunculus repens* (Creeping Buttercup)
- *Romulea rosea* (Onion Grass)
- *Rosa rubiginosa* (Sweet Briar)
- *Rubus fruticosus* sp. agg. (Blackberry complex)
- *Senecio jacobaea* (Ragwort)
- *Sporobolus fertilis* (Giant Parramatta Grass)
- *Vinca major* (Periwinkle).

5.3.2 Plant community types and vegetation zones

Ten PCTs were identified within the disturbance footprint. These PCTs are summarised in Table 5.7, shown in Figure 5.1.

Table 5.7 Vegetation within the disturbance footprint (early works and main works)

PCT ID	Plant community type name	Vegetation formation	Vegetation Class	Percentage cleared (NSW)	Direct impacts (ha) in highly modified condition (VI score <20)[1]	Direct impacts (ha) in better condition (VI score >20)	Direct impacts (ha) in all condition states
3211	Central Tableland Montane Wet Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	Southern Escarpment Wet Sclerophyll Forests	21%	0	7.30	7.30
3347	Southern Tableland Creekflat Ribbon Gum Forest	Grassy Woodlands	Tableland Clay Grassy Woodlands	65%	1.44	0	1.44
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	Grassy Woodlands	Tableland Clay Grassy Woodlands	82%	3.07	3.59	6.66
3367	Central Tableland Granites Grassy Box Woodland	Grassy Woodlands	Southern Tableland Grassy Woodlands	78%	12.17	12.11	24.28
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	Grassy Woodlands	Southern Tableland Grassy Woodlands	62%	0	26.04	26.04
3385	Southern Tableland Creekflat Swamp Woodland	Grassy Woodlands	Subalpine Woodlands	75%	2.11	0.61	2.72
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	South East Dry Sclerophyll Forests	6%	0	8.81	8.81
3687	Newnes Plateau Peppermint-Ash Tall Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Sydney Montane Dry Sclerophyll Forests	3%	8.82	0.08	8.90
3735	Central Tableland Peppermint Shrub-Grass Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	69%	0	35.49	35.49
3747	Southern Tableland Western Hills Scribbly Gum Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	65%	0	8.00	8.00
Subtotals					**27.61 ha**	**102.03 ha**	**-**
Total							**129.64 ha**

Note: Under the BAM, vegetation with a VI score less than 20 does not generate an ecosystem credit requirement unless it is a TEC or habitat for a threatened species.

Table 5.8 to Table 5.11 show the vegetation integrity scores and extent of vegetation zones to be impacted within the early works disturbance footprint, separated by IBRA subregions. Table 5.12 shows vegetation integrity scores and extent of vegetation zones to be impacted within the main works disturbance footprint, which are all within the Hill End IBRA subregion. Full descriptions and justifications for the eight PCTs in the development footprint are presented in Table 5.13 to Table 5.21.

Table 5.8 Vegetation zones identified within the Hill End IBRA Subregion area of the early works disturbance footprint with impact areas

PCT ID	PCT name	Condition (see Table 5.2)	Vegetation zone name	Extent in disturbance footprint (ha)	Vegetation integrity (VI) score
3211	Central Tableland Montane Wet Forest	Moderate	3211_Moderate	0.48	76.4
3347	Southern Tableland Creekflat Ribbon Gum Forest	DEGH[1]	3347_DEGH	0.32	9.1
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	Moderate	3348_Moderate	0.18	64.9
3367	Central Tableland Granites Grassy Box Woodland	Moderate	3367_Moderate	1.50	86.1
		Derived Shrubland	3367_DS	0.10	59.8
		Poor	3367_Poor	0.17	79.5
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	Moderate	3369_Moderate	1.20	97.6
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	High	3650_High	0.19	81.4
3735	Central Tableland Peppermint Shrub-Grass Forest	High	3735_High	2.23	93.9
3747	Southern Tableland Western Hills Scribbly Gum Forest	High	3747_High	1.05	89.4
0	-	Unvegetated	Unvegetated	0.94	N/A
1	-	Water body	Water body	0.70	N/A

Notes: DEGH = Derived exotic grassland or herbfield.

Table 5.9 Vegetation zones identified within the Bathurst IBRA Subregion area of the early works disturbance footprint with impact areas and vegetation integrity scores

PCT ID	PCT name	Condition (see Table 5.2)	Vegetation zone name	Extent in disturbance footprint (ha)	Vegetation integrity score
3347	Southern Tableland Creekflat Ribbon Gum Forest	Sedge	3347_Sedge	0.75	13.8
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	Moderate	3348_Moderate	2.94	72.8
		DNG[1]	3348_DNG	0.13	31.4
		DEGH[2]	3348_DEGH	2.96	10.5
		Exotic	3348_Exotic	0.17	8.4
3367	Central Tableland Granites Grassy Box Woodland	Moderate	3367_Moderate	0.11	60.8
		DNG_Poor[1]	3367_DNG_Poor	10.88	18.1
		DEGH[2]	3367_DEGH	1.30	10.6
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	Moderate	3650_Moderate	0.05	82.4
0	-	Unvegetated	Unvegetated	6.44	N/A
1	-	Water body	Water body	0.82	N/A

Notes:

1. DNG = Derived native grassland.
2. DEGH = Derived exotic grassland or herbfield.

Table 5.10 Vegetation zones identified within the Burragorang IBRA Subregion area of the early works disturbance footprint with impact areas and vegetation integrity scores

PCT ID	PCT name	Condition (see Table 5.2)	Vegetation zone name	Extent in disturbance footprint (ha)	Vegetation integrity score
3385	Southern Tableland Creekflat Swamp Woodland	Poor	3385_Poor	0.36	38.5
		DNG[1]	3385_DNG	0.25	29.6
		DEGH[2]	3385_DEGH	2.11	7.2
3687	Newnes Plateau Peppermint-Ash Tall Forest	DEGH[2]	3687_DEGH	5.97	13.1
0	-	Unvegetated	Unvegetated	0.76	N/A

Notes:

1. DNG = Derived native grassland.
2. DEGH = Derived exotic grassland or herbfield.

Table 5.11 Vegetation zones identified within the Wollemi IBRA Subregion area of the early works disturbance footprint with impact areas and vegetation integrity scores

PCT ID	PCT name	Condition (see Table 5.2)	Vegetation zone name	Extent in disturbance footprint (ha)	Vegetation integrity score
3687	Newnes Plateau Peppermint-Ash Tall Forest	Moderate	3687_Poor	0.05	26.1
		DNG - Poor	3687_DNG_Poor	0.03	20.4
		DEGH[2]	3687_DEGH	2.85	16.4
0	-	Unvegetated	Unvegetated	0.15	N/A

Notes:

1. DNG = Derived native grassland.
2. DEGH = Derived exotic grassland or herbfield.

Table 5.12 Vegetation zones identified within the main works disturbance footprint with impact areas (all within the Hill End IBRA Subregion)

PCT ID	PCT name	Condition (see Table 5.2)	Vegetation zone name	Extent in disturbance footprint (ha)	Vegetation integrity (VI) score
3211	Central Tableland Montane Wet Forest	Moderate	3211_Moderate	6.82	76.4
3347	Southern Tableland Creekflat Ribbon Gum Forest	DEGH[1]	3347_DEGH	0.36	9.1
3367	Central Tableland Granites Grassy Box Woodland	Moderate	3367_Moderate	5.60	86.1
		Derived Shrubland	3367_DS	0.71	59.8
		Poor	3367_Poor	3.92	79.5
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	Moderate	3369_Moderate	24.84	97.6
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	High	3650_High	8.57	81.4
3735	Central Tableland Peppermint Shrub-Grass Forest	High	3735_High	33.26	93.9
3747	Southern Tableland Western Hills Scribbly Gum Forest	High	3747_High	6.94	89.4
0	-	Unvegetated	Unvegetated	0.04	N/A
1	-	Water body	Water body	9.42	N/A

Notes: DEGH = Derived exotic grassland or herbfield.

A description and justification for the PCTs selected are provided in Table 5.13 to Table 5.21.

Table 5.13 PCT 3211– Central Tableland Montane Wet Forest

Attribute	Description
PCT ID	3211
Common name	Central Tableland Montane Wet Forest
Vegetation class	Southern Escarpment Wet Sclerophyll Forests
Extent within the disturbance footprint	8.00 ha, comprising the following vegetation zones: • 3211_Moderate: 8.00 ha (Hill End)
Survey effort	Plots: • LL04, LL12, LL13, LL14
Description	This PCT is found in the far north of the construction envelope and consists of a tall to very tall forest which is dominated by *Eucalyptus fastigata* (Brown Barrel) with occasional *Eucalyptus viminalis* (Ribbon Gum), *Eucalyptus rubida* (Candlebark) and *Eucalyptus dives* (Broad-leaved Peppermint). The shrub layer is sparse in this PCT and consists of scattered *Senecio linearifolius* (Fireweed Groundsel), *Lomatia myricoides* (River Lomatia), *Acacia falciformis* (Broad-leaved Hickory), *Leucopogon lanceolatus*, and *Rubus parvifolius* (Native Raspberry). The groundlayer contains the ferns *Pteridium esculentum* (Bracken) and *Asplenium flabellifolium* (Necklace Fern), soft-leaved forbs such as *Hydrocotyle laxiflora* (Stinking Pennywort), *Geranium solanderi* (Native Geranium), *Viola hederacea* (Ivy-leaved Violet), *Viola betonicifolia* (Native Violet), *Acaena novae-zelandiae* (Bidgee-widgee) and *Stellaria pungens* (Prickly Starwort). Grasses and grass-like plants are also common and include species such as *Lomandra longifolia* (Spiny-headed Mat-rush), *Poa labillardierei* (Tussock), *Carex appressa* (Tall sedge), *Elymus scaber* (Wheat Grass), and *Microlaena stipoides* (Weeping Grass). Small vines, including *Billardiera scandens* (Hairy Apple Berry), and *Clematis aristata* (Old Man's Beard) are also found in this PCT. Exotic forbs and grasses occur at relatively low density and include species such as *Anthoxanthum odoratum* (Sweet Vernal Grass), *Taraxacum officinale* (Dandelion), *Cirsium vulgare* (Spear Thistle).
Vegetation zone/s condition description	All of PCT 3211 has been allocated to a single vegetation zone: 3211_Moderate. The canopy of the PCT is relatively intact however it is sparse in some areas due to relatively recent tree fall which may be related to reduced soil stability on steep slopes where the ground has been extensively disturbed by feral pigs. The shrub layer is quite sparse and may have been reduced in cover through historical disturbance, and/or the activity of feral deer and pigs. The groundcover shows moderate to high signs of disturbance due to the foraging activities of feral pigs, and a moderate level of exotic species cover.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3211 which also occur within the vegetation community in the construction envelope includes but is not limited to:

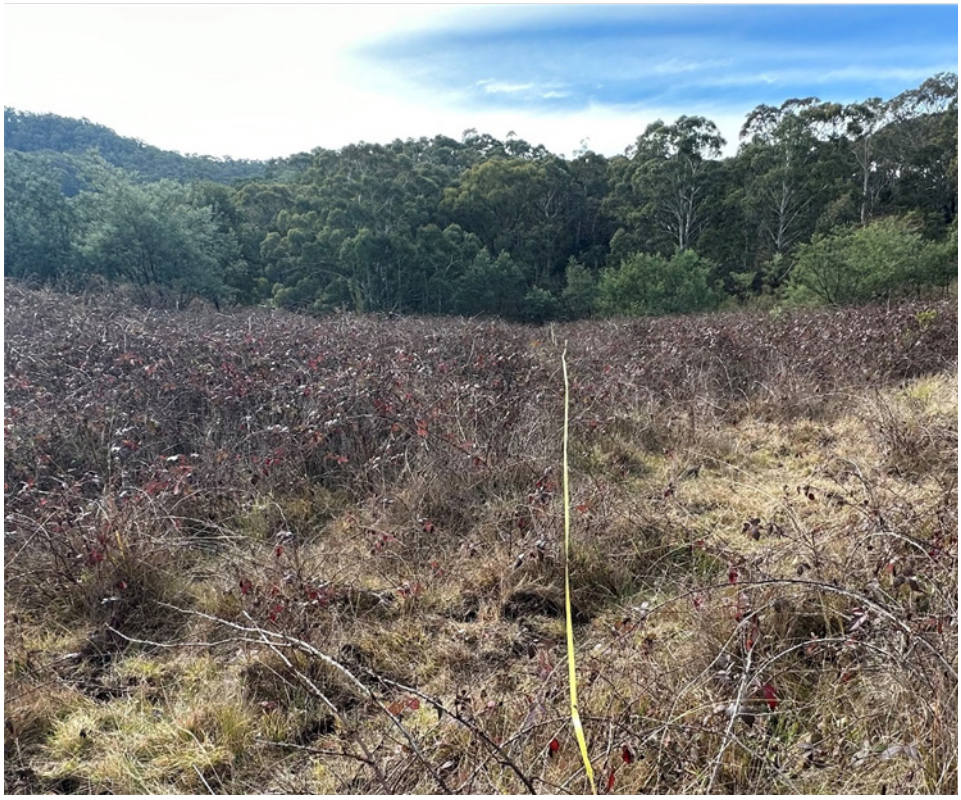
Attribute	Description
	• *Eucalyptus fastigata* • *Eucalyptus viminalis* • *Lomatia myricoides* • *Leucopogon lanceolatus* • *Rubus parvifolius* • *Acacia falciformis* • *Pteridium esculentum* • *Asplenium flabellifolium* • *Poa labillardierei* • *Carex appressa* • *Lomandra longifolia* • *Stellaria pungens* • *Viola hederacea* • *Viola betonicifolia* • *Hydrocotyle laxiflora* • *Geranium solanderi* • *Acaena novae-zelandiae* • *Senecio linearifolius.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is a wet sclerophyll forest as: • Vegetation dominated by trees (single-stemmed woody plants, or multi-stemmed mallee eucalypts that are generally more than 5 m tall when mature). • Forest or woodland dominated by eucalypts. • Tall forest (typically >30 m) dominated by tall straight-trunked eucalypts, usually with soft-leaved shrubs, ferns or herbs in the understorey, on moderately fertile soils in sheltered locations, relatively near to the coast in an area receiving more than 900 mm of rain on average per annum. There are three wet sclerophyll forests PCTs associated with the Hill End IBRA Subregion: • PCT 3211 Central Tableland Montane Wet Forest • PCT 3294 Central Tableland Peppermint-Gum Montane Forest • PCT 3303 Central Tableland Ribbon Gum Sheltered Forest. The understorey in all three of these PCTs is similar to that of the site, all containing a sparse sub-canopy of Acacia species (e.g. *Acacia falciformis*), scattered shrubs (e.g. *Rubus parvifolius*) and a ground layer of soft herbs (e.g. *Hydrocotyle laxiflora*), ferns (e.g. *Pteridium esculentum*), grasses (*Poa labillardierei*) and grass-like plants (e.g. *Lomandra longifolia*). PCT 3303 occurs on deep sheltered drainage lines and adjacent footslopes, often holding sandy alluvium or colluvium, in hilly to mountainous terrain in moist, higher parts of the Central Tablelands. In PCT 3303, the canopy is typically dominated by *Eucalyptus viminalis* often with *Eucalyptus dalrympleana* and containing *Eucalyptus fastigata* at much lower frequency than other eucalypts (3%). The relevant vegetation in the Study Area is clearly dominated by *Eucalyptus fastigata*. PCT 3294 occurs on ridges and upper slopes on high, cool eastern ranges of the Central Tablelands. PCT 3211 occurs on sheltered, often south-facing slopes and gullies of the high, cool and moist central plateau and scattered peaks of the Central Tablelands. The landscape of the area mapped as PCT 3211 is a protected, roughly south-facing slope at high elevation near the top of a draining line, below the highest ridgeline in the vicinity. In PCT 3294, the canopy is typically dominated by *Eucalyptus radiata* and *Eucalyptus dalrympleana* with *Eucalyptus fastigata* occurring at relatively low frequency (17%). The vegetation in the construction envelope is similar to this PCT but has a higher frequency of *Eucalyptus fastigata* and no *Eucalyptus radiata* nor *Eucalyptus dalrympleana*. PCT 3294 is known to grade into PCT 3211 on moist sheltered aspects (BioNet Vegetation Classification).

Attribute	Description
	PCT 3211 is considered the best fit for the areas dominated by *Eucalyptus fastigata* within the construction envelope as it is the only PCT associated in the Hill End IBRA Subregion that is fully consistent with the vegetation and landscape position characteristics observed.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of TECs.
Estimate of percent cleared value of PCT across its distribution	21%
Patch size	>100 ha entered in BAM Calculator (BAM-C)
Example photos	 *Central Tableland Montane Wet Forest - Vegetation zone 3211_Moderate, Example 1*

Attribute	Description
	 *Central Tableland Montane Wet Forest - Vegetation zone 3211_Moderate, Example 2*

Table 5.14 PCT 3347 – Southern Tableland Creekflat Ribbon Gum Forest

Attribute	Description
PCT ID	3347
Common name	Southern Tableland Creekflat Ribbon Gum Forest
Vegetation class	Tableland Clay Grassy Woodlands
Extent within the disturbance footprint	1.46 ha, comprising the following vegetation zones: • 3347_DEGH: 0.71 ha (Hill End) • 3347_Sedge: 0.75 ha (Bathurst)
Survey effort	Plots: • 3347_DEGH: LL05-06-24 • 3347_Sedge: LL_Camp01
Description	This PCT was identified within the lowest, flattest parts of the construction envelope associated with the small areas of residual floodplain vegetation of Farmers Creek and Collits Swamp Creek. On Farmers Creek, the PCT (vegetation zone 3347_DEGH) consists of a flat to gently sloping area, devoid of any mature trees, with only occasional saplings of *Acacia dealbata* (Silver Wattle). Native shrubs are absent but there is a dense exotic shrub layer consisting of *Rubus fruticosus* species complex (Blackberry). Groundcover is sparse to absent under Blackberry thickets but moderately dense in a few small open areas and consists of a mix of exotic grasses such as *Dactylis glomerata* (Cocksfoot), native grasses such as *Microlaena stipoides* (Weeping Grass), exotic forbs such as *Trifolium repens* (White Clover) and native forbs such as *Hydrocotyle laxiflora* (Stinking Pennywort). Exotic grasses and forbs are much more abundant than native species in this vegetation zone. On Collits Swamp Creek, the PCT (vegetation zone 3347_Sedge) consists of a flat area, devoid of any trees. Native shrubs are absent but there is a sparse shrub layer consisting of *Rubus fruticosus* species complex (Blackberry). Groundcover is dense and heavily dominated by a single species of native sedge, *Carex appressa* (Tall Sedge). The exotic forb, *Ranunculus repens* (Creeping Buttercup) and the exotic grass *Phalaris aquatica* (Phalaris) are moderately abundant. A variety of other exotic forbs and grasses occur at low density along with several native forbs, such as *Geranium solanderi* (Native Geranium). The native grass *Poa labillardieri* (Tussock) is scattered through the area.
Vegetation zones/s condition description	All areas of PCT 3347 in the construction envelope are in highly modified condition and have been allocated to the following vegetation zones: • 3347_DEGH; This vegetation zone is clearly dominated by exotic species, particularly Blackberry and exotic grasses, with a very low diversity and abundance of native plants • 3347_Sedge; This vegetation zone is clearly dominated by a single native sedge species (*Carex appressa*, Tall Sedge) with a very low diversity and diversity of other native plants and a variety of exotic species.
Characteristic species for identification of PCT	The species described in the BioNet Vegetation Classification database for PCT 762 which also occur within the vegetation community in the construction envelope include: • *Acacia dealbata* • *Microlaena stipoides* • *Poa labillardierei* • *Carex appressa* • *Hydrocotyle laxiflora* • *Geranium solanderi*.
Justification of evidence used to identify the PCT	Due to the cleared and highly modified condition of the vegetation present, detailed comparison of floristic composition between the vegetation zones and PCTs was not possible. The identity of the PCT was inferred from the landscape of the vegetation, modelling of PCTs in similar terrain in the SVTM in the immediate vicinity and the few native species present.

Attribute	Description
	The creek flat areas in the construction envelope are a good match for the landscape position of PCT 3347 which is described as creek flats and gentle footslopes in undulating tablelands. PCT 3347 is mapped in the SVTM around 350 m upstream of the site on Collits Swamp Creek and in the upper reaches of Farmers Creek adjacent to the site. All of the native plant species recorded in both of the vegetation zones are consistent with PCT 3347.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of TEC.
Estimate of percent cleared value of PCT across its distribution	65%
Patch size	All zones: >100 ha entered in BAM-C
Example photos for each vegetation zone	 *Southern Tableland Creekflat Ribbon Gum Forest - Vegetation zone 3347_DEGH*

Attribute	Description
	 *Southern Tableland Creekflat Ribbon Gum Forest - Vegetation zone 3347_Sedge*

Table 5.15 PCT 3348 – Southern Tableland Granites Ribbon Gum Grassy Forest

Attribute	Description
PCT ID	3348
Common name	Southern Tableland Granites Ribbon Gum Grassy Forest
Vegetation class	Tableland Clay Grassy Woodlands
Extent within the disturbance footprint	6.72 ha, comprising: • 3348_Moderate: 0.38 ha in Hill End and 4.90 ha in Bathurst IBRA subregions • 3348_Exotic: 0.17 ha (Bathurst) • 3348_DEGH: 0.92 ha (Bathurst) • 3348_DNG: 0.35 ha (Bathurst).
Survey effort	**Plots:** • 3348_Moderate: LL_STM_02, LLAR03, LLAR04 • 3348_Exotic: LLAR06 • 3348_DEGH: LLAR05 • 3348_DNG: LL_STM_01.
Description	This PCT is one of the less abundant PCTs within the construction envelope and occurs only in the eastern end of the Sir Thomas Mitchell Drive upgrade section area of the construction envelope. Moderate condition areas of this PCT consist of open forest to woodland dominated by *Eucalyptus viminalis* and *Eucalyptus pauciflora*, with *Eucalyptus rubida*, *Eucalyptus melliodora, Eucalyptus bridgesiana* and *Eucalyptus dives* occurring at much lower density. The canopy also contains scattered individuals and small groups of the exotic tree *Pinus radiata* (Radiata Pine) There is a patchy, occasionally dense, mid-stratum within this PCT, with a variety of Acacia species such as *Acacia falciformis* (Broad-leaved Hickory), *Acacia melanoxylon* (Blackwood), *Acacia dealbata* (Silver Wattle) and *Exocarpos cupressiformis* (Cherry Ballart). Smaller shrubs and sub-shrubs are sparse in this community consisting primarily of scattered individuals and small patches of *Bursaria spinosa* (Native Blackthorn), *Cassinia aculeata* (Dolly Bush), and *Rubus parvifolius* (Native Raspberry). Native grasses and grass-like plants are dominant in the ground layer, including *Bothriochloa macra* (Red Grass), *Microlaena stipoides* (Weeping Grass), *Themeda triandra* (Kangaroo Grass), *Austrostipa scabra* (Speargrass), *Cymbopogon refractus* (Barbed Wire Grass), *Sporobolus creber* (Slender Rat's Tail Grass), *Lomandra longifolia* (Spiny-headed Mat-rush), Eragrostis leptostachya (Paddock Lovegrass), Carex breviculmis (a sedge), *Rytidosperma setaceum* (Small-flowered Wallaby Grass), and *Lomandra multiflora* (Many-flowered Mat-rush). Native forbs are moderately abundant, including species such as *Crassula sieberiana* (Australian Stonecrop), *Geranium solanderi* (Native Geranium), *Acaena novae-zelandiae* (Bidgee-widgee), *Einadia hastata* (Berry Saltbush), *Vittadinia cuneata* (Fuzzweed), *Senecio quadridentatus* (Cotton Fireweed), *Hydrocotyle laxiflora* (Stinking Pennywort), *Grona varians* (Slender Tick-trefoil), *Dianella revoluta* (Blueberry Lily). The xeric fern *Cheilanthes sieberi* (Rock Fern) is also found in the ground layer. A shrubby form of the vine, *Hardenbergia violacea* (Purple Coral Pea), is also scattered in the understorey. Exotic species are found in low to moderate abundance in the moderate condition vegetation zone (3348_Moderate), are moderately abundant co-dominant in the understorey in the derived native grassland vegetation zone (3348_DNG) and clearly dominant in the most intensively modified vegetation zones (3348_Exotic, and 3348_DEGH). Prominent exotic species present include *Rubus fruticosus sp. agg.* (Blackberry complex), *Anthoxanthum odoratum* (Sweet Vernal Grass), *Hypochaeris radicata* (Catsear), *Nassella trichotoma* (Serrated Tussock), *Sporobolus fertilis* (Giant Parramatta Grass), *Eragrostis curvula* (African Lovegrass), *Verbena bonariensis* (Purpletop), *Pyracantha angustifolia* (Firethorn) *Acetosella vulgaris* (Sheep Sorrel), *Hypericum perforatum* (St. Johns Wort), *Dactylis glomerata* (Cocksfoot), *Sporobolus africanus* (Parramatta Grass), and *Plantago lanceolata* (Lamb's Tongues).

Attribute	Description
Vegetation zones/s condition description	This community occurs in three broad condition classes (vegetation zones) which are: • **3348_Moderate:** This vegetation zone has a canopy, shrub and ground-layer that are largely intact but larger tree size classes are generally lacking, likely due to historical tree removal. They contain a low to moderate cover and diversity of exotic species, typically limited to the ground-layer • **3348_DEHG:** This exotic grassland vegetation zone has a high cover and abundance of exotic grass and forb species with very low native species cover and very low native species diversity • **3348_Exotic**: This vegetation zone is similar to the DEGH zone, but it has a canopy of exotic tree species, chiefly *Pinus radiata* (Radiata Pine) and a lower overall cover of ground layer plants.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3348 which also occur within the vegetation community in the construction envelope includes but is not limited to: *Eucalyptus bridgesiana* *Eucalyptus dives* *Eucalyptus melliodora* *Eucalyptus pauciflora* *Eucalyptus rubida* *Eucalyptus viminalis* *Acacia dealbata* *Acacia falciformis* *Acacia melanoxylon* *Exocarpos cupressiformis* *Bursaria spinosa* *Cassinia aculeata* *Rubus parvifolius* *Austrostipa scabra* *Bothriochloa macra* *Carex inversa* *Eragrostis leptostachya* *Lomandra filiformis* *Lomandra longifolia* *Microlaena stipoides* *Rytidosperma spp.* *Themeda triandra* *Acaena novae-zelandiae* *Crassula sieberiana* *Dianella revoluta* *Einadia hastata* *Geranium solanderi* *Desmodium* (*Grona*) *varians* *Hydrocotyle laxiflora* *Senecio quadridentatus* *Vittadinia cuneata* *Cheilanthes sieberi* *Hardenbergia violacea.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is a grassy woodland as, in relatively undisturbed (moderate condition) areas, it is: • vegetation dominated by trees

Attribute	Description
	• forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps • woodland, or rarely forest, that lacks an abundance of hard-leaved (sclerophyllous) shrubs in the understorey, has 'Box' eucalypts often dominant or present in the tree layer, with grasses prominent in the understorey • woodland, or rarely forest, typically 15 to 35 m tall though shorter at subalpine elevations, with groundcover continuous and dominated by perennial tussock grasses, and interspersed perennial herbs including 'geophytic' orchids and lilies, but few ephemeral herbs and grasses, with shrubs generally sparse and typically not including chenopods or other drought-tolerant species. There are seven grassy woodland PCTs associated with the Bathurst IBRA Subregion. PCT 3347, Southern Tableland Creekflat Ribbon Gum Forest, was excluded as: • PCT 3347 is a tall to very tall grassy sclerophyll open forest to woodland of creek flats and gentle footslopes but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes. PCT 3366, Central Tableland Clay Apple Box Grassy Forest, was excluded as: • PCT 3366 is a mid-high to tall grassy sclerophyll open forest to woodland of undulating fertile landscapes on soils derived from basaltic, sedimentary and granitic rocks but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rocky and sandy soil derived from granite • the most dominant eucalypt in PCT 3366, *Eucalyptus bridgesiana*, occurs only infrequently in the vegetation in question. PCT 3367, Central Tableland Clay Apple Box Grassy Forest, is similar but was excluded as: • the most dominant eucalypt in PCT 3367, *Eucalyptus bridgesiana*, occurs only infrequently in the vegetation in question. PCT 3369, Central Tableland Ranges Peppermint-Gum Grassy Forest, was excluded as: • PCT 3369 is a tall to very tall moist grassy sclerophyll open forest found on sheltered slopes of ranges along the high cool spine of the Central Tablelands but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite • the most dominant eucalypts in PCT 3369, *Eucalyptus dives*, occurs only infrequently in the vegetation in question and the second and third most dominant eucalypts in PCT 3369 are absent from these areas • the dominant eucalypt in the vegetation in question, *Eucalyptus viminalis*, occurs at relatively low frequency in PCT 3369. PCT 3387, Central West Creekflat Grassy Woodland, was excluded as: • PCT 3387 is a tall to very tall grassy sclerophyll woodland found on deep soils along intermittent drainage lines in gentle valley floors but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite, metasedimentary and sedimentary rocks • the dominant eucalypt in PCT 3387, *Eucalyptus blakelyi*, is absent from the vegetation in question and the broader site. PCT 3376, Southern Tableland Grassy Box Woodland, was excluded as: • PCT 3376 is a tall sclerophyll woodland found on low hills of the drier parts of the Southern Tablelands (predominantly) on granite, volcanic and sedimentary substrates in cold, dry environments with a mean annual rainfall typically below 760 mm, whereas the vegetation in question is a low to moderate height woodland in the Central Tablelands, found predominantly on moderately steep slopes on thinner, poorer, rockier soil in an area with mean annual rainfall (at nearby Lithgow) exceeding 900 mm per annum • the second most dominant eucalypt in PCT 3376, *Eucalyptus blakelyi*, is absent from the vegetation in question and the broader site

Attribute	Description
	• the dominant eucalypt in the vegetation in question, *Eucalyptus viminalis*, occurs at very low frequency (1%) in PCT 3376. PCT 3348, Southern Tableland Granites Ribbon Gum Grassy Forest, is considered the best fit for the areas in question as: • PCT 3348 is a grassy sclerophyll open forest to woodland found on undulating to rolling tableland landscapes on sandy soils derived from granitoid and acid volcanic substrates; this matches well with the landscape and granite substrate of the vegetation in question • the dominant canopy species in the area, *Eucalyptus viminalis* and *Eucalyptus pauciflora* are the two most frequently recorded eucalypt species listed for PCT 3348 • the other trees recorded in the vegetation in question (*Eucalyptus bridgesiana*, *Eucalyptus melliodora*, *Eucalyptus dives*, *Eucalyptus rubida* and *Acacia dealbata*, and *Acacia melanoxylon*) are all associated with PCT 3348 • the understorey species composition is a good match for PCT 3367 with most species present listed in the description of PCT 3348. PCT 3348 is considered the best fit for the areas in question as it is the only PCT associated in the Bathurst IBRA Subregion that is fully consistent with the vegetation structure, floristic composition soils, and landscape position characteristics observed.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of TECs.
Estimate of percent cleared value of PCT across its distribution	82%
Patch size	All zones: >100 ha entered in BAM-C
Example photos for each vegetation zone	 *Southern Tableland Granites Ribbon Gum Grassy Forest - Vegetation zone 3348_Moderate, Example 1*

Attribute	Description
	 *Southern Tableland Granites Ribbon Gum Grassy Forest - Vegetation zone 3348_Moderate, Example 2*  *Southern Tableland Granites Ribbon Gum Grassy Forest - Vegetation zone 3348_DNG*

Attribute	Description



Southern Tableland Granites Ribbon Gum Grassy Forest - Vegetation zone 3348_Exotic



Southern Tableland Granites Ribbon Gum Grassy Forest - Vegetation zone 3348_DEGH between road and fence

Table 5.16 PCT 3367 – Central Tableland Granites Grassy Box Woodland

Attribute	Description
PCT ID	3367
Common name	Central Tableland Granites Grassy Box Woodland
Vegetation class	Southern Tableland Grassy Woodlands
Extent within the disturbance footprint	24.49 ha, comprising: • 3367_Moderate: 7.82 ha (Hill End), 0.13 ha (Bathurst) • 3367_Poor: 3.42 ha (Hill End) • 3367_Shrub: 0.79 ha (Hill End) • 3367_DNG_Poor: 10.89 ha (Bathurst) • 3367_DEGH: 1.44 ha (Bathurst).
Survey effort	**Plots:** • 3367_Moderate: LL_250724, LL06-06-24, LLAR01, LLAR02 • 3367_Poor: LL03-06-24, LLPoor01 • 3367_Shrub: LLShrub01 • 3367_DNG_Poor: LL_Camp02, LL_Camp03, LL_Camp05 • 3367_DEGH: LL_Camp04.
Description	This PCT is one of the dominant PCTs within the area of the construction envelope to the south of Farmers Creek, including but not limited to the locations of the access road and accommodation camp. Moderate condition areas of this PCT consist of open forest to woodland dominated by a mix of *Eucalyptus bridgesiana*, *Eucalyptus rubida*, *Eucalyptus melliodora* and *Eucalyptus dives*, with *Eucalyptus pauciflora* and *Eucalyptus viminalis* also occurring in more protected small gullies and lower slopes. There is a patchy mid-stratum within this PCT, with a variety of Acacia species such as *Acacia melanoxylon* (Blackwood), *Acacia dealbata* (Silver Wattle) and *Exocarpos cupressiformis* (Cherry Ballart). Smaller shrub and sub-shrub species which occur include *Bursaria spinosa* (Native Blackthorn), *Persoonia linearis* (Narrow-leaved Geebung), *Lissanthe strigosa* (Peach Heath), *Brachyloma daphnoides* (Daphne Heath), *Cassinia Sifton* (Sifton Bush), *Cryptandra amara* (Bitter Cryptandra), *Hibbertia obtusifolia* (Hoary Guinea Flower), *Dillwynia phylicoides* (Parrot-pea), and *Astroloma humifusum* (Native Cranberry) and *Pimelea curviflora* (Rice Flower). Native grasses and grass-like plants are prominent in the ground layer, including *Lomandra confertifolia* (Matrush), *Microlaena stipoides* (Weeping Grass), *Dichelachne spp*. (plumegrasses), *Poa sieberiana* (Snowgrass), *Themeda triandra* (Kangaroo Grass), *Aristida ramosa* (Purple Wiregrass), *Rytidosperma racemosum* (Wallaby Grass), and *Lomandra multiflora* (Many-flowered Mat-rush). Native forbs are also abundant, including species such as *Hypericum gramineum* (Small St John's Wort), *Geranium solanderi* (Native Geranium), *Acaena novae-zelandiae* (Bidgee-widgee), *Hydrocotyle laxiflora* (Stinking Pennywort), *Goodenia hederacea* (Ivy Goodenia), *Dianella revoluta* (Blueberry Lily), *Dichondra repens* (Kidney Weed), *Chrysocephalum apiculatum* (Common Everlasting), *Solenogyne bellioides* (Solengyne), *Cymbonotus lawsonianus* (Bear's Ear), and *Veronica plebeia* (Trailing Speedwell). The xeric fern *Cheilanthes sieberi* (Rock Fern) is also found in the ground layer. Exotic species are found in low to moderate abundance in better condition vegetation zones (3367_DNG_Moderate, 3367_Derived Shrubland), are co-dominant to dominant in the understorey in lower condition vegetation zones (3367_Poor, 3367_DNG_Poor) and clearly dominant in the most intensively modified vegetation zones (3367_Exotic_trees, 3367_Exotic_Grassland). Prominent exotic species present include *Rubus fruticosus sp. agg.* (Blackberry complex), *Anthoxanthum odoratum* (Sweet Vernal Grass), *Hypochaeris radicata* (Catsear), *Nassella trichotoma* (Serrated Tussock), *Dactylis glomerata* (Cocksfoot), *Briza maxima* (Quaking Grass), *Verbena bonariensis* (Purpletop), *Hypericum perforatum* (St. Johns Wort), and *Plantago lanceolata* (Lamb's Tongues).

Attribute	Description
Vegetation zones/s condition description	This community occurs in five broad condition classes (vegetation zones) including: • **3367_Moderate:** This vegetation zone has a canopy, shrub and ground-layer that are largely intact but larger tree size classes are generally lacking, likely due to historical tree removal. They contain a moderate cover and diversity of exotic species, typically limited to the ground-layer • **3367_Derived Shrubland**: This vegetation zone is similar to the Moderate zone, but the canopy is reduced to small saplings, the shrub layer is relatively dense due to maintenance of powerline clearance distances and exotic cover is somewhat lower • **3367_Poor:** This vegetation zone has a sparse canopy, and a shrub and ground layer containing substantial exotic shrubs and forbs interspersed with native species • **3367_DNG Poor:** This vegetation zone has little or no tree or shrub cover, and a very reduced cover and diversity of native ground layer plants. The poor condition ground layer is dominated by a small number of native species with exotic species also abundant • **3367_Exotic Grassland (DEGH):** This vegetation zone has a high cover and abundance of exotic grass and forb species with very low native species cover and very low native species diversity.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3367 which also occur within the vegetation community in the construction envelope includes but is not limited to: *Eucalyptus bridgesiana* *Eucalyptus dives* *Eucalyptus melliodora* *Eucalyptus pauciflora* *Eucalyptus rubida* *Eucalyptus viminalis* *Acacia dealbata* *Acacia melanoxylon* *Acacia falciformis* *Astroloma humifusum* *Brachyloma daphnoides* *Bursaria spinosa* *Cassinia sifton* *Exocarpos cupressiformis* *Hibbertia obtusifolia* *Lissanthe strigosa* *Persoonia linearis* *Pimelea curviflora* *Aristida ramosa* *Dichelachne spp.* *Lomandra multiflora* *Microlaena stipoides* *Poa sieberiana* *Rytidosperma racemosum* *Themeda triandra* *Acaena novae-zelandiae* *Chrysocephalum apiculatum* *Cymbonotus lawsonianus* *Dianella revoluta* *Dichondra repens* *Geranium solanderi* *Goodenia hederacea*

Attribute	Description
	Hydrocotyle laxiflora *Hypericum gramineum* *Veronica plebeia* *Cheilanthes sieberi.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is a grassy woodland as, in relatively undisturbed (moderate condition) areas, it is: • vegetation dominated by trees • forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps • woodland, or rarely forest, that lacks an abundance of hard-leaved (sclerophyllous) shrubs in the understorey, has 'Box' eucalypts often dominant or present in the tree layer, with grasses prominent in the understorey • woodland, or rarely forest, typically 15 to 35 m tall though shorter at subalpine elevations, with groundcover continuous and dominated by perennial tussock grasses, and interspersed perennial herbs including 'geophytic' orchids and lilies, but few ephemeral herbs and grasses, with shrubs generally sparse and typically not including chenopods or other drought-tolerant species. There are nine grassy woodland PCTs associated with the Hill End IBRA Subregion. PCT 3347, Southern Tableland Creekflat Ribbon Gum Forest, was excluded as: • PCT 3347 is a tall to very tall grassy sclerophyll open forest to woodland of creek flats and gentle footslopes but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes • the dominant eucalypts in PCT 3347, *Eucalyptus viminalis* and *Eucalyptus pauciflora*, occur only infrequently in the vegetation in question • *Eucalyptus melliodora* is infrequent (2%) in PCT 3347 but is more common in the vegetation in question. PCT 3366, Central Tableland Clay Apple Box Grassy Forest, was excluded as: • PCT 3366 is a mid-high to tall grassy sclerophyll open forest to woodland of undulating fertile landscapes on soils derived from basaltic, sedimentary and granitic rocks but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite, metasedimentary and sedimentary rocks • one of the dominant eucalypts in PCT 3366, *Eucalyptus viminalis*, occurs only infrequently in the vegetation in question • while the understorey is similar there are multiple species that are relatively common in the vegetation in question that are not associated with PCT 3366, such as *Lissanthe strigosa*, *Persoonia linearis*, *Veronica plebeia*, *Hydrocotyle laxiflora*, and *Dianella revoluta*. PCT 3369, Central Tableland Ranges Peppermint-Gum Grassy Forest, was excluded as: • PCT 3369 is a tall to very tall moist grassy sclerophyll open forest found on sheltered slopes of ranges along the high cool spine of the Central Tablelands but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite, metasedimentary and sedimentary rocks • the most dominant eucalypts in PCT 3369, *Eucalyptus dives*, occurs only infrequently in the vegetation in question and the second most dominant eucalypt in PCT 3369 is absent from these areas • the dominant eucalypts in the vegetation in question, which are *Eucalyptus bridgesiana*, *E. melliodora* and *E. rubida*, all occur at only low frequency in PCT 3369.

Attribute	Description
	PCT 3370, Central Tableland Red Stringybark Grassy Forest, was excluded as: • PCT 3370 is a tall to very tall dry grassy sclerophyll open forest that occurs on gentle slopes on undulating tableland country but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite, metasedimentary and sedimentary rocks • the most dominant eucalypts in PCT 3370, *Eucalyptus macrorhyncha* and *Eucalyptus goniocalyx* are absent or extremely rare in the construction envelope and in the vegetation in question. PCT 3387, Central West Creekflat Grassy Woodland, was excluded as: • PCT 3387 is a tall to very tall grassy sclerophyll woodland found on deep soils along intermittent drainage lines in gentle valley floors but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite, metasedimentary and sedimentary rocks • the dominant eucalypt in PCT 3387, *Eucalyptus blakelyi*, is absent from the vegetation in question and the broader site. PCT 3376, Southern Tableland Grassy Box Woodland, was excluded as: • PCT 3376 is a tall sclerophyll woodland found on low hills of the drier parts of the Southern Tablelands (predominantly) on granite, volcanic and sedimentary substrates in cold, dry environments with a mean annual rainfall typically below 760 mm, whereas the vegetation in question is a low to moderate height woodland in the Central Tablelands, found predominantly on moderately steep slopes on thinner, poorer, rockier soil in an area with mean annual rainfall (at nearby Lithgow) exceeding 900 mm per annum • the second most dominant eucalypt in PCT 3376, *Eucalyptus blakelyi*, is absent from the vegetation in question and the broader site. PCT 3388, Central West Valleys White Box Forest, was excluded as: • PCT 3388 is a tall sclerophyll open forest with a sparse mid-stratum with soft-leaved species and a mid-dense, grassy ground layer that is found on the undulating floor of valleys nestled among the sandstone ranges of the Central-west Slopes, but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite, metasedimentary and sedimentary rocks • none of the dominant trees in PCT 3388, *Eucalyptus albens*, *Brachychiton populneus* and *Callitris endlicheri*, occurs in the vegetation in question. PCT 3396, Northwest Slopes Box-Blakelys Red Gum Woodland was excluded as: • PCT 3396 is a tall sclerophyll open forest with a mid-dense, grassy ground layer that occurs on valley flats and lower slopes but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on thinner, poorer, rockier soil derived from granite, metasedimentary and sedimentary rocks • four of the six most dominant trees in PCT 3396 (*Eucalyptus blakelyi, Angophora floribunda, Brachychiton populneus, Notelaea microcarpa*, and *Eucalyptus albens*) are absent from the vegetation in question and the broader site. PCT 3399, Southwest Hills White Box-Blakelys Red Gum Forest, was excluded as: • eight of the nine most dominant trees (frequency of 20% or greater) in PCT 3399 (*Eucalyptus blakelyi, Eucalyptus macrorhyncha, Brachychiton populneus, Eucalyptus polyanthemos, Callitris endlicheri, Eucalyptus sideroxylon, Eucalyptus goniocalyx* and *Eucalyptus albens*) are absent from or extremely uncommon in the vegetation in question and the broader site. PCT 3406, Southwest Ranges White Box Woodland, was excluded as: • PCT 3406 is a tall sclerophyll woodland to open forest with a mid-stratum that is sparse or absent and a mid-dense grassy ground layer that occurs on slopes in undulating to hilly terrain on the South and Central-west Slopes and the western margin of the tablelands but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on the Central Tablelands • four of the five most dominant trees (frequency of 15% or greater) in PCT 3406 (*Eucalyptus blakelyi, Eucalyptus macrorhyncha, Brachychiton populneus,* and *Eucalyptus albens*) are absent from or extremely uncommon in the vegetation in question and the broader site.

Attribute	Description
	PCT 3406, Southwest Ranges White Box Woodland, was excluded as: • PCT 3406 is a tall sclerophyll woodland to open forest with a mid-stratum that is sparse or absent and a mid-dense grassy ground layer that occurs on slopes in undulating to hilly terrain on the South and Central-west Slopes and the western margin of the tablelands but the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on the Central Tablelands • four of the five most dominant trees (frequency of 15% or greater) in PCT 3406 (*Eucalyptus blakelyi, Eucalyptus macrorhyncha, Brachychiton populneus,* and *Eucalyptus albens*) are absent from or extremely uncommon in the vegetation in question and the broader site. PCT 3367, Central Tableland Granites Grassy Box Woodland, is considered the best fit for the areas in question as: • the dominant canopy species in the area, *Eucalyptus bridgesiana* and *Eucalyptus melliodora* are among the dominant species listed for PCT 3367 • all of the seven most dominant trees (frequency of 15% or greater) in PCT 3367 (*Eucalyptus bridgesiana, Eucalyptus viminalis, Eucalyptus melliodora, Eucalyptus dives, Acacia dealbata, Acacia melanoxylon,* and *Eucalyptus pauciflora*) are present in the area in question • PCT 3367 is a mid-high to tall sclerophyll grassy woodland of sandy soils derived from granitoid, rhyolite, quartzite or quartz diorite rocks in undulating to hilly landscapes in moderately cool, dry broad river valleys of the Central Tablelands and the vegetation in question is a low to moderate height woodland, found predominantly on moderately steep slopes on the Central Tablelands on granite, metasedimentary and sedimentary rocks • the understorey species composition is a good match for PCT 3367 with most species present listed in the description of PCT 3367. PCT 3367 is considered the best fit for the areas in question as it is the only PCT associated in the Hill End IBRA Subregion that is fully consistent with the vegetation structure, floristic composition soils, and landscape position characteristics observed.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See section 5.3.4 for more detailed discussion of threatened ecological communities.
Estimate of percent cleared value of PCT across its distribution	78%
Patch size	All zones: >100 ha entered in BAM-C

Attribute	Description
Example photos for each vegetation zone	 *Central Tableland Granites Grassy Box Woodland - Vegetation zone 3367_Moderate*  *Central Tableland Granites Grassy Box Woodland - Vegetation zone 3367_Poor, with Blackberry (Rubus fruticosus sp. complex) abundant in understorey and appearing reddish due to winter dormancy*

Attribute	Description
	 *Central Tableland Granites Grassy Box Woodland - Vegetation zone 3367_DS (Derived Shrubland) in foreground, located in existing power transmission line easment*  *Central Tableland Granites Grassy Box Woodland - Vegetation zone 3367_DNG_Poor at accommodation camp site, dominated by Weeping Grass (Microlaena stipoides) with African Lovegrass (Eragrostis curvula) tussocks*

Attribute	Description
	 *Central Tableland Granites Grassy Box Woodland - Vegetation zone 3367_DEGH at accommodation camp site, dominated by African Lovegrass (Eragrostis curvula)*

Table 5.17 PCT 3369 Central Tableland Ranges Peppermint-Gum Grassy Forest

Attribute	Description
PCT ID	3369
Common name	Central Tableland Ranges Peppermint-Gum Grassy Forest
Vegetation class	Southern Tableland Grassy Woodlands
Extent within the disturbance footprint	25.43 ha, comprising: • 3369_Moderate: 25.43 ha (Hill End).
Survey effort	**Plots:** • LL01, LL01-06-24, LL02-06-24, LL09
Description	On more protected slopes and in small tributary valleys, a tall open forest occurs, which is typically dominated by a combination of *Eucalyptus* dives, *Eucalyptus viminalis* and *Eucalyptus pauciflora*, with *Eucalyptus rubida,* occasional *Eucalyptus bridgesiana* (Apple Box) and a sub-canopy of acacias such as *Acacia falciformis* (Broad-leaved Hickory), *Acacia melanoxylon* (Blackwood) and *Acacia implexa* (Hickory Wattle). The low to tall shrub stratum can vary from moderately dense (Acacia) to open and includes *Acacia falciformis*, *Bursaria spinosa* (Native Blackthorn), *Lomatia myricoides* (River Lomatia), *Rubus parvifolius* (Native Raspberry), *Leucopogon lanceolatus, Lissanthe strigosa* (Peach Heath), *Hibbertia obtusifolia* (Hoary Guinea Flower) and *Persoonia linearis* (Narrow-leaved Geebung). The moderate density native groundcover vegetation includes grasses and grass-like species such as *Poa sieberiana* (Snowgrass), *Microlaena stipoides* (Weeping Grass), *Poa labillardierei* (Tussock), *Lomandra longifolia* (Spiny-headed Mat-rush), *Rytidosperma fulvum* (Wallaby Grass), *Austrostipa rudis* (a Speargrass), Echinopogon ovatus (Forest Hedgehog Grass) and *Lomandra filiformis* (Wattle Matt-rush). The forb component of the ground layer is predominantly composed of soft-leaved plants and includes species such as *Viola hederacea* (Ivy-leaved Violet), *Gonocarpus tetragynus* (Poverty Raspwort), *Poranthera microphylla* (Small Poranthera), *Acaena novae-zelandiae* (Bidgee-widgee), *Geranium solanderi* (Native Geranium), *Euchiton japonicus*, *Plantago debilis* (Shade Plantain), *Viola betonicifolia* (Native Violet), *Stellaria pungens* (Prickly Starwort), *Rumex brownii* (Swamp Dock), *Hydrocotyle laxiflora* (Stinking Pennywort), *Arthropodium milleflorum* (Pale Vanilla-lily), and *Hypericum gramineum* (Small St John's Wort). The groundlayer contains also the ferns *Adiantum aethiopicum* (Common Maidenhair), and *Pteridium esculentum* (Bracken). Small vines, including *Glycine clandestina* (Twining glycine) and *Clematis aristata* (Old Man's Beard) are also found in this PCT at low density. Exotic forbs and grasses occur at low to moderate density and include species such as *Anthoxanthum odoratum* (Sweet Vernal Grass), *Dactylis glomerata* (Cocksfoot), *Stellaria media* (Common Chickweed), *Cirsium vulgare* (Spear Thistle), *Galium aparine* (Goosegrass), *Solanum chenopodioides* (Whitetip Nightshade), *Prunella vulgaris* (Self-heal), and *Rubus fruticosus* sp. complex (Blackberry).
Vegetation zones/s condition description	All of PCT 3369 has been allocated to a single vegetation zone: 3369_Moderate. This community is in moderate condition with all layers present though somewhat degraded. The tree layer is largely intact, containing many mature and hollow-bearing trees, though some canopy gaps may have resulted from ground disturbance and tree fall associated with the activities of feral animals such as pigs and deer and historical land uses. Native cover and diversity in the understorey may also have been reduced due to feral animal activity and weed invasion in the ground layer facilitated by disturbance associated with feral pigs.
Characteristic species for identification of PCT	The species described in the BioNet Vegetation Classification database for PCT 3369 which also occur within the vegetation community in the construction envelope include: • *Eucalyptus dives* • *Eucalyptus viminalis* • *Eucalyptus pauciflora* • *Eucalyptus rubida* • *Eucalyptus bridgesiana* • *Acacia falciformis*

Attribute	Description
	• *Acacia melanoxylon* • *Bursaria spinosa* • *Lomatia myricoides* • *Rubus parvifolius* • *Leucopogon lanceolatus* • *Lissanthe strigosa* • *Hibbertia obtusifolia* • *Persoonia linearis* • *Poa sieberiana* • *Microlaena stipoides* • *Poa labillardierei* • *Lomandra longifolia* • *Rytidosperma fulvum* • *Austrostipa rudis* • *Echinopogon ovatus* • *Lomandra filiformis* • *Viola hederacea* • *Gonocarpus tetragynus* • *Poranthera microphylla* • *Acaena novae-zelandiae* • *Geranium solanderi* • *Euchiton japonicus* • *Plantago debilis* • *Viola betonicifolia* • *Stellaria pungens* • *Rumex brownii* • *Hydrocotyle laxiflora* • *Arthropodium milleflorum* • *Hypericum gramineum* • *Adiantum aethiopicum* • *Pteridium esculentum* • *Glycine clandestina* • *Clematis aristata*.
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is in the Grassy Woodlands formation, as in relatively undisturbed (moderate condition) areas, it is: • vegetation dominated by trees • forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs. The vegetation in question is a forest with some ferns at relatively low density but no shrubs with broad, soft leaves and while borderline, fits more closely with this category than the alternative which constitutes wet sclerophyll forest • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps • woodland, or rarely forest, that lacks an abundance of hard-leaved (sclerophyllous) shrubs in the understorey, has 'Box' eucalypts often dominant or present in the tree layer, with grasses prominent in the understorey. While the vegetation in question does not have box eucalypts dominant, *Eucalyptus bridgesiana* (Apple Box) does occur occasionally in the community and grasses prominent in the understorey

Attribute	Description
	• woodland, or rarely forest, typically 15-35 m tall though shorter at subalpine elevations, with groundcover continuous and dominated by perennial tussock grasses, and interspersed perennial herbs including 'geophytic' orchids and lilies, but few ephemeral herbs and grasses, with shrubs generally sparse and typically not including chenopods or other drought-tolerant species. While the vegetation of the site is not typical of the Grassy Woodlands formation, neither is the PCT to which it has been allocated (PCT 3369), which is described as "a tall to very tall moist grassy sclerophyll open forest", contains box type eucalypts at only low frequency, contains ferns at moderate frequency and is assigned to the Grassy Woodlands formation in the BioNet Vegetation Classification. There are nine grassy woodland PCTs associated with the Hill End IBRA Subregion. PCT 3347, Southern Tableland Creekflat Ribbon Gum Forest, was excluded as: • PCT 3347 occurs on creek flats and gentle footslopes but the vegetation in question is found predominantly on moderately to extremely steep slopes • *Eucalyptus dives* occurs frequently in the vegetation in question but occurs at relatively low frequency (15 %) in PCT 3347 • *Acacia falciformis* is a prominent component of the vegetation in question but this species is not associated with PCT 3347. PCT 3366, Central Tableland Clay Apple Box Grassy Forest, was excluded as: • PCT 3366 occurs on undulating fertile landscapes on soils derived from basaltic, sedimentary and granitic rocks but the vegetation in question is a low to moderate height woodland, found predominantly on moderately to extremely steep slopes on metasedimentary and sedimentary rocks • the most dominant eucalypts in PCT 3366, *Eucalyptus bridgesiana*, occurs only infrequently in the vegetation in question • two of the four most frequent eucalypts in PCT 3366, *Eucalyptus melliodora* and *Eucalyptus macrorhyncha* are absent or extremely rare in the vegetation in question. PCT 3367, Central Tableland Granites Grassy Box Woodland, was excluded as: • PCT 3367 is mid-high to tall sclerophyll grassy woodland of sandy soils derived from granitoid, rhyolite, quartzite or quartz diorite rocks in undulating to hilly landscapes in moderately cool, dry broad river valleys but the vegetation in question is a moderate height to tall, somewhat moist open forest, found predominantly on moderately to extremely steep slopes on soils derived from sedimentary and meta-sedimentary rocks • two of the three most dominant eucalypt species in PCT 3367, *Eucalyptus bridgesiana* and *Eucalyptus melliodora* are relatively infrequent in the vegetation in question • the groundcover stratum in the vegetation in question contains a higher proportion of more mesic forbs than seen in PCT 3367. PCT 3370, Central Tableland Red Stringybark Grassy Forest, was excluded as: • PCT 3370 is a tall to very tall dry grassy sclerophyll open forest that occurs on gentle slopes on undulating tableland country but the vegetation in question is a moderate height to tall, somewhat moist open forest, found predominantly on moderately to extremely steep slopes • the most dominant eucalypts in PCT 3370, *Eucalyptus macrorhyncha* and *Eucalyptus goniocalyx* are absent or extremely rare in the construction envelope and in the vegetation in question. PCT 3387, Central West Creekflat Grassy Woodland, was excluded as: • PCT 3387 is a tall to very tall grassy sclerophyll woodland found on deep soils along intermittent drainage lines in gentle valley floors but the vegetation in question is moderate height to tall, somewhat moist open forest, found predominantly on moderately to extremely steep slopes • the most dominant eucalypts in PCT 3387, *Eucalyptus blakelyi* and *Eucalyptus melliodora*, are absent from the vegetation in question or occur at very low frequency. PCT 3376, Southern Tableland Grassy Box Woodland, was excluded as: • PCT 3376 is a tall sclerophyll woodland found on low hills of the drier parts of the Southern Tablelands (predominantly) on granite, volcanic and sedimentary substrates in cold, dry environments with a mean annual rainfall typically below 760 mm, whereas the vegetation in question is a moderate height to tall, somewhat moist open forest, found predominantly on

Attribute	Description
	moderately to extremely steep slopes in an area with mean annual rainfall (at nearby Lithgow) exceeding 900 mm per annum • the most dominant eucalypts in PCT 3376, *Eucalyptus blakelyi* and *Eucalyptus melliodora*, are absent from the vegetation in question or occur at very low frequency. PCT3388, Central West Valleys White Box Forest, was excluded as: • PCT 3388 is a tall sclerophyll open forest that is found on the undulating floor of valleys nestled among the sandstone ranges of the Central-west Slopes, but the vegetation in question is a is a moderate height to tall, somewhat moist open forest, found predominantly on moderately to extremely steep slopes • none of the dominant trees in PCT 3388, *Eucalyptus albens, Brachychiton populneus* and *Callitris endlicheri*, occurs in the vegetation in question. PCT 3396, Northwest Slopes Box-Blakelys Red Gum Woodland was excluded as: • PCT 3396 is a tall sclerophyll open forest with a mid-dense, grassy ground layer that occurs on valley flats and lower slopes but the vegetation in question is a is a moderate height to tall, somewhat moist open forest, found predominantly on moderately to extremely steep slopes • four of the six most dominant trees in PCT 3396 (*Eucalyptus blakelyi, Angophora floribunda, Brachychiton populneus, Notelaea microcarpa*, and *Eucalyptus albens*) are absent from the vegetation in question and the broader site. PCT 3399, Southwest Hills White Box-Blakelys Red Gum Forest, was excluded as: • eight of the nine most dominant trees (frequency of 20% or greater) in PCT 3399 (*Eucalyptus blakelyi, Eucalyptus macrorhyncha, Brachychiton populneus, Eucalyptus polyanthemos, Callitris endlicheri, Eucalyptus sideroxylon, Eucalyptus goniocalyx* and *Eucalyptus albens*) are absent from or extremely uncommon in the vegetation in question and the broader site. PCT 3406, Southwest Ranges White Box Woodland, was excluded as: • PCT 3406 is a tall sclerophyll woodland to open forest that occurs on slopes in undulating to hilly terrain on the South and Central-west Slopes and the western margin of the tablelands but the vegetation in question is a moderate height to tall, somewhat moist open forest, found predominantly on moderately to extremely steep slopes on the Central Tablelands • four of the five most dominant trees (frequency of 15% or greater) in PCT 3406 (*Eucalyptus blakelyi, Eucalyptus macrorhyncha, Brachychiton populneus*, and *Eucalyptus albens*) are absent from or extremely uncommon in the vegetation in question and the broader site. PCT 3369, Central Tableland Ranges Peppermint-Gum Grassy Forest, was considered to be the best fit as: • PCT 3369 is a tall to very tall moist grassy sclerophyll open forest found on sheltered slopes of ranges along the high cool spine of the Central Tablelands and the vegetation in question is a moderate height to tall, somewhat moist open forest, found predominantly on moderately to extremely steep slopes • three of the most dominant eucalypts in the vegetation in question, *Eucalyptus dives*, *E. pauciflora* and *E. viminalis* occur at moderate to high frequency (71%, 29% and 16%, respectively) in PCT 3369. The fourth species that occurs in moderate frequency in the vegetation in question, *Eucalyptus rubida*, occurs at low frequency in PCT 3369 • all of the most frequently occurring Acacia species in PCT 3369 are also common in the vegetation in question • the shrub and ground layer vegetation in the vegetation in question is a close match for PCT 3369.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of threatened ecological communities.
Estimate of percent cleared value of PCT across its distribution	62%
Patch size	>100 ha

Attribute	Description
Example photos	 *Central Tableland Ranges Peppermint-Gum Grassy Forest - Vegetation zone 3369_Moderate, Example 1*  *Central Tableland Ranges Peppermint-Gum Grassy Forest - Vegetation zone 3369_Moderate, Example 2*

Table 5.18 PCT 3687 Newnes Plateau Peppermint-Ash Tall Forest

Attribute	Description
PCT ID	3687
Common name	Newnes Plateau Peppermint-Ash Tall Forest
Vegetation class	Sydney Montane Dry Sclerophyll Forests
Extent within the disturbance footprint	8.93 ha, comprising the following vegetation zones: • 3687_Moderate: 0.05 ha (Wollemi) • 3687_DNG_Poor: 0.03 ha (Wollemi) • 3687_DEGH: 5.97 ha (Burragong), 2.88 ha (Wollemi).
Survey effort	**Plots:** • PE01, PE02, PE04, PE05.
Vegetation zones/s condition description	**3687_Moderate** The very small moderate condition area of the PCT in the construction envelope (vegetation zone 3687_Moderate) consists of overhanging trees, predominantly of *Eucalyptus blaxlandii* (Blaxland's Stringybark), with *Pinus* sp (exotic pines) and non-locally-indigenous species *Acacia baileyana* (Cootamundra Wattle). Other trees in this community in adjacent areas include *Eucalyptus sieberi* (Silvertop Ash), *Eucalyptus dives* (Broad-leaved Peppermint), *Eucalyptus viminalis* (Ribbon Gum) and *Acacia dealbata* (Silver Wattle). The understorey in this area contains a mixture of native species such as *Leucochrysum albicans var. albicans* and *Aristida* spp. and exotic species such as *Rubus fruticosus* (Blackberry). **3687_DNG_Poor** The very small 3687_DNG_Poor zone consists of an area of low diversity derived native grassland dominated by *Austrostipa* sp. (speargrass). **3687_DEGH** The 3687_DEGH zone consists of an area of mixed exotic and native grassland growing on highly disturbed soil, primarily imported fill material. Native species in this zone are likely a mix of species emerging from imported soils and species from the pre-clearing vegetation community that have persisted despite heavy ground disturbance. Abundant exotic species in this vegetation zone include *Anthoxanthum odoratum* (Sweet Vernal Grass), *Paspalum dilatatum* (Paspalum), *Plantago lanceolata* (Lamb's Tongues), *Hypochaeris radicata* (Catsear), and *Cenchrus clandestinus* (Kikuyu Grass). Hardy native species including *Cynodon dactylon* (Common Couch) *Bothriochloa macra* (Red Grass), *Euchiton sphaericus* (Star Cudweed) and *Chloris truncata* (Windmill Grass) are also abundant.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3687 which also occur within or adjacent to the vegetation community in the construction envelope includes but is not limited to: • *Eucalyptus blaxlandii* • *Eucalyptus sieberi* • *Eucalyptus dives* • *Eucalyptus viminalis* • *Acacia dealbata* • *Bursaria spinosa* • *Cassinia Sifton* • *Leucopogon lanceolatus* • *Persoonia linearis* • *Hibbertia obtusifolia* • *Poa sieberiana* • *Oxalis perennans* • *Solenogyne bellioides* • *Gonocarpus teucrioides*

Attribute	Description
	• *Microlaena stipoides.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is in the Dry Sclerophyll Forest formation, as in relatively undisturbed (moderate condition) areas, it is: • vegetation dominated by trees • forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps • forests or rarely woodlands with a moderate abundance of hard-leaved (sclerophyllous) shrubs in the understorey, not dominated by 'box' eucalypts, with a groundcover dominated by sedges, grasses and grass-like plants on relatively infertile sandy or loamy soils. Analysis using the PCT filter tool showed that two PCTs in the Wollemi or Burragorang IBRA subregion in the Dry sclerophyll forests formation contain all of the tree species observed in the community on the site: PCT 3687 and PCT 3735. PCT 3735, Central Tableland Peppermint Shrub-Grass Forest, was excluded as: • it occurs on dry slopes and broad crests in rolling hilly country as opposed to the relatively steep footslopes of the site • *Eucalyptus blaxlandii* occurs at low frequency (4%) in PCT 3735 but is co-dominant to dominant on the site • PCT 3735 includes *Eucalyptus dives* at high frequency (94%) but this species occurs at low density in the vegetation in question. PCT 3687, Newnes Plateau Peppermint-Ash Tall Forest, was considered to be the best fit as: • it is associated with Banks Wall Sandstone and at its margins with underlying Illawarra Coal Measures sediments, and these soil and landscape characteristics match well with the environment occupied by the vegetation in question • it often contains *Eucalyptus blaxlandii* (47% frequency) and the vegetation in question is dominated or co-dominated by *Eucalyptus blaxlandii* • all of the tree species recorded in the vegetation in question are also associated with PCT 3687 • the elevation range of 950-1200 metres asl, matches the environment of the vegetation in question • the structure and composition of the understorey are consistent with PCT 3687.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of threatened ecological communities.
Estimate of percent cleared value of PCT across its distribution	69%
Patch size	>100 ha entered in BAM-C

Attribute	Description
Example photo	 *Newnes Plateau Peppermint-Ash Tall Forest - Vegetation zone PCT 3687_Moderate*  *Newnes Plateau Peppermint-Ash Tall Forest - Vegetation zone PCT 3687_DEGH*

Table 5.19 PCT 3650 Goulburn-Lithgow Ranges Silvertop Ash Forest

Attribute	Description
PCT ID	3650
Common name	Goulburn-Lithgow Ranges Silvertop Ash Forest
Vegetation class	South East Dry Sclerophyll Forests
Extent within the disturbance footprint	9.49 ha, comprising: • 3369_High: 9.49 ha (Hill End).
Survey effort	**Plots:** • LL15, LL16, LL18.
Description	This PCT occurs as, mid-height to tall open eucalypt forest, dominated by *Eucalyptus sieberi* (Silvertop Ash), with other trees such as *Eucalyptus rubida* (Candelbark), *Eucalyptus rossii* (Inland Stringybark) and *Eucalyptus dives* (Broad-leaved Peppermint), sub-dominant or scattered. The shrub layer is sparse and patchy and consists of species such as *Podolobium ilicifolium* (Prickly Shaggy Pea), *Acacia terminalis* (Sunshine Wattle), *Persoonia linearis* (Narrow-leaved Geebung), *Hibbertia obtusifolia* (Hoary Guinea Flower), *Leucopogon lanceolatus*, *Dillwynia phylicoides* (Parrot-pea), *Acacia ulicifolia* (Prickly Moses), *Platysace ericoides*, *Comesperma ericinum* (Pyramid Flower), *Conospermum taxifolium* (Variable Smoke-bush) and *Brachyloma daphnoides* (Daphne Heath). The ground layer is rocky, with the vegetation present, relatively sparse and of relatively low diversity and dominated by grasses and grass-like plants and xeric forbs. Grasses and grass-like plants include *Poa sieberiana* (Snowgrass), *Entolasia stricta* (Wiry Panic), *Aristida calycina, Lomandra filiformis* (Wattle Matt-rush).Forbs in the ground later include *Patersonia sericea* (Silky Purple-Flag), *Phyllanthus hirtellus* (Thyme Spurge), *Gonocarpus tetragynus* (Poverty Raspwort), *Poranthera microphylla* (Small Poranthera), *Stylidium graminifolium* (Grass Triggerplant), *Eriochilus cucullatus* (Parson's Bands), *Chiloglottis* sp.(a wasp orchid), *Goodenia hederacea* (forest goodenia), and *Pomax umbellata* (Pomax). The small vine, *Billardiera scandens* (Hairy Apple Berry), is also found in this PCT at low density. Exotic forbs and grasses occur at low to very low density and include species such as *Hypochaeris radicata* (Catsear), and *Anthoxanthum odoratum* (Sweet Vernal Grass).
Vegetation zones/s condition description	All of PCT 3650 has been allocated to a single vegetation zone: 3650_High. This community is in high condition with all layers present and minimal degradation evident. The tree layer is intact, containing many mature and hollow-bearing trees. Native cover and diversity in the understorey may also have been somewhat reduced due to feral animal activity.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3650 which also occur within the vegetation community in the construction envelope includes but is not limited to: • *Eucalyptus rubida* • *Eucalyptus rossii* • *Eucalyptus dives* • *Podolobium ilicifolium* • *Acacia terminalis* • *Persoonia linearis* • *Hibbertia obtusifolia* • *Leucopogon lanceolatus,* • *Dillwynia phylicoides* • *Acacia ulicifolia* • *Platysace ericoides* • *Comesperma ericinum* • *Conospermum taxifolium* • *Brachyloma daphnoides*

Attribute	Description
	• *Poa sieberiana* • *Entolasia stricta* • *Aristida calycina* • *Lomandra filiformis* • *Patersonia sericea* • *Phyllanthus hirtellus* • *Gonocarpus tetragynus* • *Poranthera microphylla* • *Stylidium graminifolium* • *Eriochilus cucullatus* • *Chiloglottis sp.* • *Goodenia hederacea* • *Pomax umbellata* • *Billardiera scandens.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is in the Dry Sclerophyll Forest formation, as in relatively undisturbed (moderate condition) areas, it is: • vegetation dominated by trees • forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps • forests or rarely woodlands with a moderate abundance of hard-leaved (sclerophyllous) shrubs in the understorey, not dominated by 'box' eucalypts, with a groundcover dominated by sedges, grasses and grass-like plants on relatively infertile sandy or loamy soils. Analysis using the PCT filter tool showed that only two PCTs in the Hill End IBRA subregion in the Dry sclerophyll forests formation contains *Eucalyptus sieberi;* PCTs 3747 and 3735. PCT 3735, Central Tableland Peppermint Shrub-Grass Forest, was excluded as: • PCT 3735 almost always includes *Eucalyptus dives*, but this species is scarce in the vegetation in question • the dominant tree species in the vegetation in question, *Eucalyptus sieberi*, occurs at a frequency of just 6% in PCT 3735. PCT 3747, Southern Tableland Western Hills Scribbly Gum Forest, was excluded as: • three of the four most frequent eucalypts in PCT 3747, *Eucalyptus macrorhyncha*, *Eucalyptus mannifera*, and *Eucalyptus goniocalyx* are absent or extremely rare in the vegetation in question • the dominant tree species in the vegetation in question, *Eucalyptus sieberi*, occurs at a frequency of just 6% in PCT 3747. Conversely, *Eucalyptus rossii* occurs very frequently in PCT 3747 but at relatively low frequency in the vegetation in question. As none of the PCTs associated with the Hill End IBRA subregion were considered a good match, the PCT filter tool was used to identify candidate PCTs from the adjacent Bathurst IBRA subregion. This search identified four PCTs in the Bathurst IBRA subregion in the Dry sclerophyll forests formation which contains *Eucalyptus sieberi*; PCTs 3650, 3738, 3601 and 3653. PCT 3738, Goulburn-Lithgow Tableland Hills Grassy Forest, was excluded as: • PCT 3738 occurs on gentle slopes in undulating tableland landscapes but the vegetation in question occurs on moderately to extremely steep slopes in a hilly area • tree canopy of PCT 3738 very frequently contains *Eucalyptus mannifera* and *Eucalyptus macrorhyncha* but in the vegetation in question, these species are absent or very infrequent • *Eucalyptus sieberi* is relatively infrequent (12%) in PCT 3738 but dominant or co-dominant throughout the vegetation in question.

Attribute	Description
	PCT 3601, Burragorang Footslopes Scribbly Gum Forest, was excluded as: • it is a tall, occasionally very tall, dry shrubby sclerophyll open forest or woodland found on exposed footslopes below steep escarpments of the Burragorang Valley, southern Blue Mountains, and this structure and landscape position do not closely match those of the vegetation question • none of the dominant eucalypt species in PCT 3601 (frequency >10%) occur in the vegetation in question. PCT 3653, Kanangra Peaks Silvertop Ash Forest, was excluded as: • it is found on exposed residual sandstone and quartzite on high peaks and ranges of the southern Blue Mountains and Kanangra-Boyd national park, and this geology, landscape position and location do not closely match those of the vegetation question • other than *Eucalyptus sieberi*, none of the dominant eucalypt species in PCT 3653 (frequency >10%) occur in the vegetation in question • the understorey in PCT 3653 contains numerous species that are restricted to very nutrient poor, typically sandstone-derived soils, and these species are absent from the vegetation in question. PCT 3650, Goulburn-Lithgow Ranges Silvertop Ash Forest, was considered to be the best fit as: • it is associated with shallow rocky soils on steep slopes or crests, and these soil and landscape characteristics match well with the environment occupied by the vegetation in question • it almost always contains *Eucalyptus sieberi* (99% frequency) and the vegetation in question is dominated or co-dominated by *Eucalyptus sieberi* • all of the tree species recorded in the vegetation in question are also associated with PCT 3650 • the elevation range of 650-1200 metres asl, and rainfall range of 750-1110 mm annually, match the environment of the vegetation in question • the structure and composition of the understorey are consistent with PCT 3650.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of threatened ecological communities.
Estimate of percent cleared value of PCT across its distribution	6%
Patch size	>100 ha entered in BAM-C

Attribute	Description
Example photo	 *Goulburn-Lithgow Ranges Silvertop Ash Forest - Vegetation zone 3650_High*

Table 5.19 PCT 3385 Southern Tableland Creekflat Swamp Woodland

Attribute	Description
PCT ID	3385
Common name	Southern Tableland Creekflat Swamp Woodland
Vegetation class	Subalpine Woodlands
Extent within the disturbance footprint	8.93 ha, comprising the following vegetation zones: • 3385_Poor: 0.36 ha (Burragong) • 3385_DNG: 0.25 ha (Burragong) • 3385_DEGH: 2.11 ha (Burragong).
Survey effort	**Plots:** • PE01, PE02, PE03.
Vegetation zones/s condition description	**3385_Poor** The small poor condition area of the PCT in the construction envelope (vegetation zone 3385_Poor) consists of mature *Acacia dealbata* (Silver Wattle) over a mixed native and exotic grassy ground layer. Overhanging trees, of *Eucalyptus stellulata* (Black Sally), *Eucalyptus viminalis* (Ribbon Gum) and *Eucalyptus pauciflora* (Snow Gum). The shrub *Ozothamnus diosmifolius* (White Dogwood) occurs at very low density. The ground layer in this area contains a mixture of native species such as *Microlaena stipoides* (Weeping Grass), *Anthosachne scabra* (Common Wheatgrass), and *Austrostipa nodosa* (a speargrass). Exotic species such *Agrostis capillaris* (Browntop Bent), and *Hypochaeris radicata* (Catsear) are abundant in the ground layer. **3385_DNG** The very small 3385_DNG zone consists of an area dominated by of low diversity of native grasses and forbs, mixed with exotic species. Native ground layer species in this zone include *Microlaena stipoides* (Weeping Grass), *Austrostipa nodosa* (a speargrass), and *Coronidium monticola.* Exotic species such *Anthoxanthum odoratum (*Sweet Vernal Grass), *Rubus fruticosus* sp. agg. (Blackberry complex) and *Hypochaeris radicata* (Catsear) are moderately abundant in the ground layer. It also contains a few saplings of *Acacia dealbata* (Silver Wattle) and *Eucalyptus viminalis* (Ribbon Gum). **3385_DEGH** The 3385_DEGH zone consists of an area of mixed exotic and native grassland growing on highly disturbed soil. Abundant exotic species in this vegetation zone include *Agrostis capillaris* (Browntop Bent), *Acetosella vulgaris* (Sheep Sorrel), and *Trifolium repens* (White Clover). Hardy native species including *Microlaena stipoides* (Weeping Grass) and *Juncus australis* (Rush) are moderately abundant.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3385 which also occur within or adjacent to the vegetation community in the construction envelope includes but is not limited to: • *Acacia dealbata* • *Eucalyptus pauciflora* • *Eucalyptus stellulata* • *Eucalyptus viminalis* • *Acaena echinata* • *Acaena novae-zelandiae* • *Carex inversa* • *Dichondra repens* • *Elymus scaber* • *Eragrostis leptostachya* • *Euchiton sphaericus* • *Geranium solanderi*

Attribute	Description
	• *Gonocarpus teucrioides* • *Juncus australis* • *Microlaena stipoides* • *Oxalis perennans* • *Rytidosperma pilosum* • *Solenogyne bellioides* • *Solenogyne gunnii* • *Veronica plebeia.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is a grassy woodland as, in relatively undisturbed (moderate condition) areas, outside of the construction envelope, it is: • vegetation dominated by trees • forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps • woodland, or rarely forest, that lacks an abundance of hard-leaved (sclerophyllous) shrubs in the understorey, has 'Box' eucalypts often dominant or present in the tree layer, with grasses prominent in the understorey • woodland, or rarely forest, typically 15 to 35 m tall though shorter at subalpine elevations, with groundcover continuous and dominated by perennial tussock grasses, and interspersed perennial herbs including 'geophytic' orchids and lilies, but few ephemeral herbs and grasses, with shrubs generally sparse and typically not including chenopods or other drought-tolerant species. Analysis using the PCT filter tool showed that no PCTs in the Burragorang IBRA subregion in the grassy woodlands formation. As the site is at the boundary of the Burragorang subregion and the Wollemi subregion, the Wollemi subregion was considered in the identification of the PCT. Only one PCT in the grassy woodlands formation is associated with the Wollemi subregion and contains all of the tree species observed in the community on the site: PCT 3385. Two other grassy woodland PCTs that are also associated with the Wollemi subregion and with four of the five tree species were also considered in determining the PCT; PCT 3369 and PCT 3376. PCT 3369, Central Tableland Ranges Peppermint-Gum Grassy Forest, was excluded as: • the three most abundant tree species in PCT 3369, *Eucalyptus dives, Eucalyptus dalrympleana* and *Eucalyptus macrorhyncha* are absent from the in the vegetation in question • *Eucalyptus stellulata* was recorded in the vegetation in question but is not associated with PCT 3369. PCT 3376, Southern Tableland Grassy Box Woodland, was excluded as: • the three most abundant tree species in PCT 3376, *Eucalyptus melliodora, Eucalyptus blakelyi* and *Eucalyptus bridgesiana* are absent from the in the vegetation in question • *Eucalyptus stellulata* was recorded in the vegetation in question but is not associated with PCT 3376. PCT 3385, Southern Tableland Creekflat Swamp Woodland, was considered to be the best fit as: • it is associated with restricted to damp drainage flats along high, cool and moist eastern ranges of the South Eastern Highlands bioregion commonly on granitic and sandstone substrates, and these soil (sandstone) and landscape (stream flats) characteristics match well with the environment occupied by the vegetation in question • it often contains *Eucalyptus pauciflora* (91% frequency), *Eucalyptus stellulata* (60%) and Acacia dealbata (23%) and the vegetation in question contains these species • all of the tree species recorded in the vegetation in question are also associated with PCT 3385 • the elevation range of 770 to 1,250 metres asl, matches the environment of the vegetation in question

Attribute	Description
	• the structure and composition of the understorey are consistent with PCT 3385.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of threatened ecological communities.
Estimate of percent cleared value of PCT across its distribution	75%
Patch size	>100 ha entered in BAM-C
Example photo	

Attribute	Description
	Southern Tableland Creekflat Swamp Woodland - Vegetation zone PCT 3385_Poor
	
	Southern Tableland Creekflat Swamp Woodland - Vegetation zone PCT 3385_DNG
	
	Southern Tableland Creekflat Swamp Woodland - Vegetation zone PCT 3385_DEGH

Table 5.20 PCT 3735 Central Tableland Peppermint Shrub-Grass Forest

Attribute	Description
PCT ID	3735
Common name	Central Tableland Peppermint Shrub-Grass Forest
Vegetation class	Southern Tableland Dry Sclerophyll Forests
Extent within the disturbance footprint	36.19 ha, comprising: • 3369_Moderate: 36.19 ha (Hill End)..
Survey effort	**Plots:** • LL03, LL05, LL07, LL04-06-24, LL08, LL10.
Description	This PCT occurs as, mid-height to tall open eucalypt forest, typically dominated by *Eucalyptus dives* (Broad-leaved Peppermint), with other trees such as *E. rossii* and *E. rubida,* and E. *melliodora* sometimes with a sub-canopy of *Acacia melanoxylon*, *Acacia implexa* or *Acacia falciformis* (Broad-leaved Hickory). In one location, a mid-dense sub-canopy of *Allocasuarina littoralis* (Black Sheoak) is present. The shrub layer is sparse and patchy and consists of species such as *Persoonia linearis* (Narrow-leaved Geebung), *Hibbertia obtusifolia* (Hoary Guinea Flower), *Cassinia Sifton* (Sifton Bush), *Lissanthe strigosa* (Peach Heath), *Leucopogon lanceolatus*, *Bursaria spinosa* (Native Blackthorn), *Dillwynia phylicoides* (Parrot-pea), and *Brachyloma daphnoides* (Daphne Heath) and *Leucopogon pilifer* (Thready Beard-heath). The ground layer is dominated by grasses and grass-like plants, forbs and subshrubs. Grasses and grass-like plants include *Lomandra longifolia* (Spiny-headed Mat-rush), *Poa siberiana* (Snowgrass), *Cymbopogon refractus* (Barbed Wire Grass), *Lomandra confertifolia* (Matrush), *Lomandra filiformis* (Wattle Matt-rush), *Microlaena stipoides* (Weeping Grass), *Rytidosperma pallidum* (Redanther Wallaby Grass), *Anthosachne scabra* (Wheatgrass), *Rytidosperma racemosum* (Wallaby Grass), *Austrostipa rudis* (a speargrass), *Aristida jerichoensis* (Jericho Wiregrass), *Poa labillardierei* (Tussock), *Carex inversa* (Knob Sedge), *Lepidosperma laterale* (Variable Sword-sedge), and *Dichelachne inaequiglumis* (a plumegrass). Forbs in the ground later include *Dianella revoluta* (Blueberry Lily), *Hydrocotyle laxiflora* (Stinking Pennywort), *Patersonia sericea* (Silky Purple-Flag), *Hypericum gramineum* (Small St John's Wort), *Gonocarpus teucrioides* (Germander Raspwort), *Goodenia heterophylla, Stypandra glauca* (Nodding Blue Lily), *Laxmannia gracilis* (Slender Wire Lily), *Stylidium graminifolium* (Grass Triggerplant), *Crassula sieberiana* (Australian Stonecrop), *Xerochrysum bracteatum* (Golden Everlasting), and *Opercularia varia* (Variable Stinkweed). The groundlayer contains also the ferns *Pteridium esculentum* (Bracken) and *Cheilanthes sieberi* (Rock Fern) which are tolerant of high sun exposure. Small vines, including *Hardenbergia violacea* (False Sarsaparilla), *Glycine clandestina* (Twining glycine) and *Billardiera scandens* (Hairy Apple Berry), and are also found in this PCT at low density. Exotic forbs and grasses occur at low to moderate density and include species such as *Hypochaeris radicata* (Catsear), *Anthoxanthum odoratum* (Sweet Vernal Grass), *Hypericum perforatum* (St John's Wort), *Cirsium vulgare* (Spear Thistle), *Galium aparine* (Goosegrass), *Solanum chenopodioides* (Whitetip Nightshade), *Prunella vulgaris* (Self-heal), and *Rubus fruticosus* sp. complex (Blackberry).
Vegetation zone/s condition description	All of PCT 3735 has been allocated to a single vegetation zone: 3735_Moderate. This community is in moderate condition with all layers present though somewhat degraded. The tree layer is largely intact, containing many mature and hollow-bearing trees, though some canopy gaps may have resulted from historical land uses. Native cover and diversity in the understorey may also have been reduced due to feral animal activity and weed invasion in the ground layer facilitated by disturbance associated with feral pigs.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3735 which also occur within the vegetation community in the construction envelope includes but is not limited to: • *Eucalyptus dives* • *Eucalyptus rossii*

Attribute	Description
	• *Acacia dealbata* • *Acacia melanoxylon* • *Eucalyptus pauciflora* • *Eucalyptus rubida* • *Eucalyptus sieberi* • *Eucalyptus melliodora* • *Eucalyptus viminalis* • *Hibbertia obtusifolia* • *Brachyloma daphnoides* • *Persoonia linearis* • *Dillwynia phylicoides* • *Leucopogon lanceolatus* • *Platysace ericoides* • *Acacia falciformis* • *Bossiaea buxifolia* • *Lissanthe strigosa* • *Veronica perfoliata* • *Cassinia Sifton* • *Astroloma humifusum* • *Bursaria spinosa* • *Gompholobium uncinatum* • *Pimelea curviflora* • *Cheilanthes sieberi* • *Pteridium esculentum* • *Poa sieberiana* • *Lomandra filiformis* • *Rytidosperma pallidum* • *Microlaena stipoides* • *Lomandra longifolia* • *Dichelachne inaequiglumis* • *Poa labillardierei* • *Aristida ramosa* • *Dichelachne rara* • *Luzula flaccida* • *Austrostipa rudis* • *Elymus scaber* • *Lepidosperma laterale* • *Rytidosperma racemosum* • *Aristida jerichoensis* • *Dianella revoluta* • *Poranthera microphylla* • *Stylidium graminifolium* • *Goodenia hederacea* • *Hypericum gramineum* • *Hydrocotyle laxiflora* • *Patersonia sericea* • *Chrysocephalum apiculatum* • *Senecio quadridentatus* • *Pomax umbellata*

Attribute	Description
	• *Crassula sieberiana* • *Xerochrysum bracteatum* • *Stypandra glauca* • *Hardenbergia violacea* • *Billardiera scandens* • *Glycine clandestina* • *Clematis aristata.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is in the Dry Sclerophyll Forest formation, as in relatively undisturbed (high condition) areas, it is: • vegetation dominated by trees • forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs. The vegetation in question is a forest with some ferns at relatively low density but no shrubs with broad, soft leaves and while borderline, fits more closely with this category than the alternative which constitutes wet sclerophyll forest • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps • forests or rarely woodlands with a moderate abundance of hard-leaved (sclerophyllous) shrubs in the understorey, not dominated by 'box' eucalypts, with a groundcover dominated by sedges, grasses and grass-like plants on relatively infertile sandy or loamy soils. Analysis using the PCT filter tool showed that four PCTs in the Hill End IBRA subregion in the Dry sclerophyll forests formation contain *Eucalyptus dives* which is the dominant/ co-dominant tree species; PCTs 3534, 3747, 3734, and 3735. While the vegetation in question is not entirely typical of the Dry Sclerophyll Forest formation due to its more grassy ground layer and only moderate cover of sclerophyll shrubs, neither is the PCT to which it has been allocated (PCT 3735), which is described as "a tall dry shrub-grass sclerophyll open forest" with a "sparse to patchy shrub layer" and "very frequent high cover of *Poa sieberiana* and *Rytidosperma pallidum* and sparse *Dianella revoluta*, *Lomandra filiformis* and *Gonocarpus tetragynus*". PCT 3534, Central West Stony Hills Stringybark-Box Forest, was excluded as: • PCT 3534 has a tree canopy that almost always includes *Eucalyptus macrorhyncha*, very frequently with *Eucalyptus goniocalyx* and commonly *Eucalyptus* polyanthemos, but these species are absent or extremely rare in the vegetation in question. PCT 3747, Southern Tableland Western Hills Scribbly Gum Forest, was excluded as: • three of the four most frequent eucalypts in PCT 3366, *Eucalyptus macrorhyncha*, *Eucalyptus mannifera*, and *Eucalyptus goniocalyx*, are absent or extremely rare in the vegetation in question • PCT 3747 contains *Eucalyptus dives* but at a lower frequency than that species occurs in the vegetation in question. Conversely, *Eucalyptus rossii* occurs very frequently in PCT 3747 but at relatively low frequency in the vegetation in question. PCT 3734, Central Tableland Dry Slopes Stringybark-Box Forest, was excluded as: • tree canopy of PCT 3734 very frequently contains *Eucalyptus macrorhyncha*, commonly with *Eucalyptus goniocalyx* and occasionally *Eucalyptus bridgesiana*, *Eucalyptus melliodora* or *Eucalyptus polyanthemos* but in the vegetation in question, *Eucalyptus macrorhyncha, Eucalyptus goniocalyx* and *Eucalyptus polyanthemos* are absent and *Eucalyptus bridgesiana* and *Eucalyptus melliodora* are infrequent • *Eucalyptus dives* is relatively infrequent (13%) in PCT 3734 but dominant or co-dominant throughout the vegetation in question. PCT 3735, Central Tableland Peppermint Shrub-Grass Forest, was considered to be the best fit as: • PCT 3735 is a tall dry shrub-grass sclerophyll open forest of high, cool, central parts of the Central Tablelands, generally on dry slopes and broad crests in rolling hilly country and the

Attribute	Description
	vegetation in question is a moderate height to tall, found predominantly on moderately steep slopes and hill crests • the elevation range of 800 to 1,250 metres asl, and rainfall range of 700-1050 mm annually, match the environment of the vegetation in question • the canopy of PCT 3735 almost always includes *Eucalyptus dives*, a species that is dominant or co-dominant throughout the vegetation in question • while three of the most frequently recorded tree species in PCT 3735 are absent from the vegetation in question, all of the tree species recorded in the vegetation in question are also associated with PCT 3735 • the structure and composition of the understorey are consistent with PCT 3735.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of threatened ecological communities.
Estimate of percent cleared value of PCT across its distribution	69%
Patch size	>100 ha entered in BAM-C
Example photos	 *Central Tableland Peppermint Shrub-Grass Forest - Vegetation zone 3735_High, Example 1*

Attribute	Description
	 *Central Tableland Peppermint Shrub-Grass Forest - Vegetation zone 3735_High, Example 2*

Table 5.21 PCT 3747 Southern Tableland Western Hills Scribbly Gum Forest

Attribute	Description
PCT ID	3747
Common name	Southern Tableland Western Hills Scribbly Gum Forest
Vegetation class	Southern Tableland Dry Sclerophyll Forests
Extent within the disturbance footprint	8.41 ha, comprising: • 3747_High: 8.41 ha (Hill End).
Survey effort	**Plots:** • LL02, LL06, LL11.
Description	This PCT occurs as a low to mid-height open eucalypt forest, dominated by *Eucalyptus rossii* (Inland Scribbly Gum), with other trees such as *Eucalyptus rubida* (Candebark) sub-dominant or scattered. The shrub layer is sparse and patchy and consists of species such as *Acacia falciformis* (Broad-leaved Hickory), *Indigofera australis* (Australian Indigo), *Acacia terminalis* (Sunshine Wattle), *Persoonia linearis* (Narrow-leaved Geebung), *Hibbertia obtusifolia, Hakea dactyloides* (Finger Hakea), Hoary Guinea Flower, *Bossiaea buxifolia, Bursaria spinosa* (Native Blackthorn), *Astroloma humifusum* (Native Cranberry), *Leucopogon lanceolatus, Platysace ericoides, Cassinia sifton* (Sifton Bush), *Dillwynia phylicoides* (Parrot-pea), *Acacia gunnii* (Ploughshare Wattle), *Acacia ulicifolia* (Prickly Moses), *Gompholobium uncinatum* (Red Wedge Pea) and *Brachyloma daphnoides* (Daphne Heath). The ground layer is rocky, with the vegetation present, relatively sparse and of relatively low diversity and dominated by grasses and grass-like plants and xeric forbs. Grasses and grass-like plants include *Poa sieberiana* (Snowgrass), *Austrostipa rudis* (a speargrass) *Rytidosperma pallidum* (Redanther Wallaby Grass), *Lepidosperma gunnii, Entolasia stricta* (Wiry Panic), *Lepidosperma laterale* (Variable Sword-sedge), *Aristida calycina, Themeda triandra* (Kangaroo Grass) and *Lomandra filiformis* (Wattle Matt-rush). Forbs in the ground later include *Patersonia sericea* (Silky Purple-Flag), *Dianella revoluta* (Blueberry Lily), *Phyllanthus hirtellus* (Thyme Spurge), *Gonocarpus tetragynus* (Poverty Raspwort), *Poranthera microphylla* (Small Poranthera), *Goodenia hederacea* (Forest Goodenia), *Senecio diaschides, Brachyscome rigidula* (Hairy Cutleaf Daisy), Hydrocotyle laxiflora (Stinking Pennywort), Veronica plebeia (Trailing Speedwell), Goodenia bellidifolia, *Desmodium gunnii* (Slender Tick-trefoil), *Opercularia hispida* (Hairy Stinkweed), *Arthropodium milleflorum* (Pale Vanilla-lily), *Vittadinia cuneata* (A Fuzzweed) and *Dichondra repens* (Kidney Weed). The xeric fern, *Cheilanthes sieberi* (Rock Fern) occurs in this PCT at low abundance. The small vines, *Billardiera scandens* (Hairy Apple Berry), *Glycine microphylla* (Small-leaf Glycine), *and Cassytha pubescens* (Downy Dodder-laurel) are also found in this PCT at low density. Exotic forbs and grasses occur at low to very low density and include species such as *Hypochaeris radicata* (Catsear), *Rubus fruticosus* species complex (Blackberry), *Centaurium erythraea* (Common Centaury) and *Anthoxanthum odoratum* (Sweet Vernal Grass).
Vegetation zones/s condition description	All of PCT 3747 has been allocated to a single vegetation zone: 3747_High. This community is in high condition with all layers present and minimal degradation evident. The tree layer is intact, containing many mature and hollow-bearing trees. Native cover and diversity in the understorey may also have been somewhat reduced due to feral animal activity.
Characteristic species for identification of PCT	The list of species described in the BioNet Vegetation Classification database for PCT 3747 which also occur within the vegetation community in the construction envelope includes but is not limited to: • *Eucalyptus rubida* • *Eucalyptus rossii* • *Eucalyptus dives* • *Acacia falciformis* • *Acacia gunnii* • *Acacia terminalis*

Attribute	Description
	• *Acacia ulicifolia* • *Astroloma humifusum* • *Bossiaea buxifolia* • *Brachyloma daphnoides* • *Bursaria spinosa* • *Cassinia sifton* • *Indigofera australis* • *Persoonia linearis* • *Hakea dactyloides* • *Hibbertia obtusifolia* • *Dillwynia phylicoides* • *Acacia ulicifolia* • *Platysace ericoides* • *Brachyloma daphnoides* • *Poa sieberiana* • *Austrostipa rudis* • *Aristida calycina* • *Entolasia stricta* • *Lepidosperma gunnii* • *Lepidosperma laterale* • *Lomandra filiformis* • *Rytidosperma pallidum* • *Themeda triandra* • *Brachyscome rigidula* • *Dianella revoluta* • *Gonocarpus tetragynus* • *Goodenia bellidifolia* • *Goodenia hederacea* • *Hydrocotyle laxiflora* • *Opercularia hispida* • *Patersonia sericea* • *Phyllanthus hirtellus* • *Poranthera microphylla* • *Veronica plebeia* • *Cheilanthes sieberi* • *Billardiera scandens* • *Cassytha pubescens.*
Justification of evidence used to identify the PCT	Based on application of the Dichotomous Formation Key in the BioNet Vegetation Classification, the vegetation mapped as this PCT is in the Dry Sclerophyll Forest formation, as in relatively undisturbed (high condition) areas, it is: • vegetation dominated by trees • forest or woodland dominated by eucalypts • forest or woodland dominated by short to moderately tall trees (rarely >35 m), usually branching at less than half of their height, with an understorey generally lacking ferns and shrubs with broad soft leaves, with or without abundant grasses, hard-leaved shrubs or ephemeral herbs • forest or woodland generally lacking plants that tolerate inundation or waterlogging; rarely in damp, low lying sites adjacent to rivers, lakes or swamps

Attribute	Description
	• forests or rarely woodlands with a moderate abundance of hard-leaved (sclerophyllous) shrubs in the understorey, not dominated by 'box' eucalypts, with a groundcover dominated by sedges, grasses and grass-like plants on relatively infertile sandy or loamy soils. Analysis using the PCT filter tool showed that five PCTs in the Hill End IBRA subregion in the Dry sclerophyll forests formation contain the dominant tree species *Eucalyptus rossii;* PCTs 3534, 3536, 3734, 3735, and 3747. PCT 3534, Central West Stony Hills Stringybark-Box Forest, was excluded as: • PCT 3534 has a tree canopy that almost always includes *Eucalyptus macrorhyncha*, very frequently with *Eucalyptus goniocalyx* and commonly *Eucalyptus polyanthemos* but these species are absent or extremely rare in the vegetation in question. PCT 3536, Mudgee Ranges Stony Slopes Shrub Forest, was excluded as: • it occurs on ranges west of Mudgee between Carcalgong and Biraganbil and is not known to occur in the vicinity of Marrangaroo • PCT 3536 almost always includes *Eucalyptus macrorhyncha*, and very frequently includes *Eucalyptus polyanthemos*, but these species are absent or extremely rare in the vegetation in question and the broader construction envelope. PCT 3734, Central Tableland Dry Slopes Stringybark-Box Forest, was excluded as: • PCT 3734 is a tall dry grassy sclerophyll open forest of sheltered slopes and gullies, typically on sandstone substrates but the vegetation in question is a low to mid-height open forest to woodland, found on steep, rocky slopes and crests in exposed areas on fine-grained sedimentary and metasedimentary rocks • tree canopy of PCT 3734 very frequently contains *Eucalyptus macrorhyncha*, commonly with *Eucalyptus goniocalyx* and occasionally *Eucalyptus bridgesiana*, *Eucalyptus melliodora* or *Eucalyptus polyanthemos* but in the vegetation in question, *Eucalyptus macrorhyncha, Eucalyptus goniocalyx* and *Eucalyptus polyanthemos* are absent and *Eucalyptus bridgesiana* and *Eucalyptus melliodora* are absent or very infrequent. PCT 3735, Central Tableland Peppermint Shrub-Grass Forest, was excluded as: • PCT 3735 almost always includes *Eucalyptus dives*, but this species is scarce in the vegetation in question • three of the four most frequent eucalypts in PCT 3735, *Eucalyptus macrorhyncha, Eucalyptus mannifera*, and *Eucalyptus dalrympleana* are absent or extremely rare in the vegetation in question • the dominant tree species in the vegetation in question, *Eucalyptus rossii* occurs at a relatively low frequency (17%) in PCT 3735. PCT 3747, Southern Tableland Western Hills Scribbly Gum Forest, was considered to be the best fit as: • it is associated with slopes and crests of dry, rocky tableland hills and ranges on typically on quartz-rich sedimentary, acid volcanic and granitoid substrates and sometimes in areas mapped as shales or mudstones, and these soil and landscape characteristics match well with the environment occupied by the vegetation in question • it very frequently contains *Eucalyptus rossii* (84% frequency) and the vegetation in question is dominated or co-dominated by *Eucalyptus rossii* • all of the tree species recorded in the vegetation in question are also associated with PCT 3747 • the elevation range of 500 to 1,200 metres asl, and rainfall range of 600 to 920 mm annually, match the environment of the vegetation in question • the structure and composition of the understorey are consistent with PCT 3747.
Status	Not associated with any BC Act nor EPBC Act listed TEC in the BioNet Vegetation Classification database. Not consistent with any BC Act nor EPBC Act listed TEC. See Section 5.3.4 for more detailed discussion of threatened ecological communities.
Estimate of percent cleared value of PCT across its distribution	65%
Patch size	>100 ha entered in BAM-C

Attribute	Description
Example photos	 *Southern Tableland Western Hills Scribbly Gum Forest - Vegetation zone 3747_High, Example 1*  *Southern Tableland Western Hills Scribbly Gum Forest - Vegetation zone 3747_High, Example 2*

5.3.3 Vegetation integrity scores

Ten PCTs occur in the early works and main works disturbance footprints, with vegetation zones mapped and entered into the credit calculator to determine vegetation integrity scores. The vegetation integrity score is based on the plot data which is compared with benchmark values for each vegetation type. A summary of the vegetation integrity score for each vegetation zone within the early works disturbance footprint, separated by IBRA subregions, is provided in Table 5.22 to Table 5.25. Table 5.26 shows the vegetation integrity score for each vegetation zone within the main works disturbance footprint, which all occur within the Hill End IBRA subregion.

Table 5.22 Vegetation zone and impact summary for Hill End IBRA subregion area of the early works disturbance footprint

PCT ID	PCT name	Vegetation zones	Extents within disturbance footprint (ha)	Vegetation integrity score
3211	Central Tableland Montane Wet Forest	3211_Moderate	0.48	76.4
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_DEGH	0.32	9.1
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	3348_Moderate	0.18	64.9
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	1.50	86.1
		3367_DS	0.10	59.8
		3367_Poor	0.17	79.5
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	3369_Moderate	1.20	97.6
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_High	0.19	81.4
3735	Central Tableland Peppermint Shrub-Grass Forest	3735_High	2.23	93.9
3747	Southern Tableland Western Hills Scribbly Gum Forest	3747_High	1.05	89.4

Table 5.23 Vegetation zone and impact summary for Bathurst IBRA subregion area of the early works disturbance footprint

PCT ID	PCT name	Vegetation zones	Extents within disturbance footprint (ha)	Vegetation integrity score
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_Sedge	0.75	13.8
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	3348_Moderate	2.94	72.8
		3348_Poor	0.36	23.4
		3348_DNG	0.13	31.4
		3348_DEGH	2.96	10.5
		3348_Exotic	0.17	8.4
3367	Central Tableland Granites Grassy Box Woodland	3367_DNG_Poor	10.88	18.1
		3367_DEGH	1.30	10.6
		3367_Moderate	0.11	60.8
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_Moderate	0.05	82.4

Table 5.24 Vegetation zone and impact summary for Burragorang IBRA subregion area of the early works disturbance footprint

PCT ID	PCT name	Vegetation zones	Extents within disturbance footprint (ha)	Vegetation integrity score
3385	Southern Tableland Creekflat Swamp Woodland	3385_Poor	0.36	38.5
		3385_DNG	0.25	29.6
		3385_DEGH	2.11	7.2
3687	Newnes Plateau Peppermint-Ash Tall Forest	3687_DEGH	5.97	13.1

Table 5.25 Vegetation zone and impact summary for Wollemi IBRA subregion area of the early works disturbance footprint

PCT ID	PCT name	Vegetation zones	Extents within disturbance footprint (ha)	Vegetation integrity score
3687	Newnes Plateau Peppermint-Ash Tall Forest	3687_Poor	0.05	26.1
		3687_DEGH	2.88	7.8
		3687_DNG_Poor	0.03	20.4

Table 5.26 Vegetation zone and impact summary for the main works disturbance footprint (all within the Hill End IBRA subregion)

PCT ID	PCT name	Vegetation zones	Extents within disturbance footprint (ha)	Vegetation integrity score
3211	Central Tableland Montane Wet Forest	3211_Moderate	6.82	76.4
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_DEGH	0.36	9.1
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	5.60	86.1
		3367_DS	0.71	59.8
		3367_Poor	3.92	79.5
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	3369_Moderate	24.84	97.6
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_High	8.57	81.4
3735	Central Tableland Peppermint Shrub-Grass Forest	3735_High	33.26	93.9
3747	Southern Tableland Western Hills Scribbly Gum Forest	3747_High	6.94	89.4

5.3.4 Threatened ecological communities

No TECs were identified as occurring in the construction envelope.

That is, no TECs are associated with any of the PCTs identified in the construction envelope in the TEC associations in the BioNet Vegetation Classification database.

Further, TECs known or predicted to occur in the relevant IBRA subregions were compared with the characteristics of the vegetation in the construction envelope, finding none of the vegetation is consistent with any of these TECs. A summary is provided in Table 5.27 for BC Act listed TECs and in Table 13.1 for EPBC Act listed TECs.

Table 5.27 Assessment of BC Act threatened ecological communities known or predicted to occur in the relevant IBRA subregions

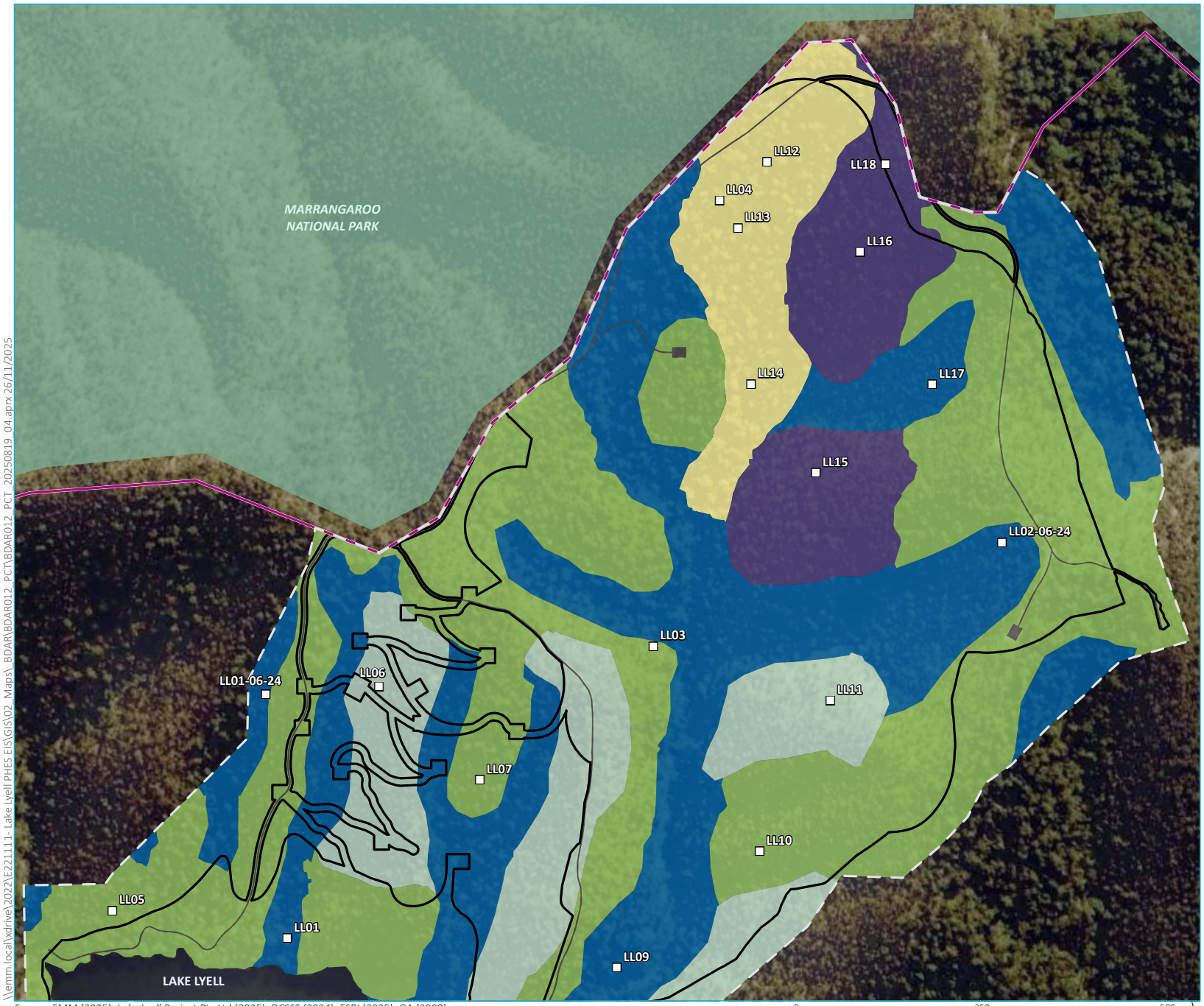
TEC name and status	Known or predicted to occur[1]	Key characteristics of TEC as described in NSW Scientific Committee determinations and associated identification guidelines	Comparison with vegetation of the construction envelope
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions (Critically Endangered)	Hill End – Known Bathurst – Known Burragorang – Known Wollemi – Known	Dominated by one or more of the species *Eucalyptus albens* (White Box), *Eucalyptus melliodora* (Yellow Box) and *E. blakelyi* (Blakely's Red Gum). Characterised by widely-spaced trees with canopies not touching and Projected foliage cover generally less than 30%. Understorey shrubs are typically sparse or absent. The groundcover is dominated by perennial tussock grasses interspersed with a range of forb species. Known to occur on hilly to undulating landscapes in areas with soils of moderate fertility derived from a range of lithologies.	No PCTs in the construction envelope contain White Box or Blakely's Red Gum. Two PCTs in the construction envelope contain Yellow Box; PCT 3348 and PCT 3367. PCT 3348 is dominated by Ribbon Gum (*Eucalyptus viminalis*), a species that is not characteristic of the TEC, with only occasional Yellow Box, and occurs on low fertility sandy soil. PCT 3367 is dominated by a mix of Apple Box (*Eucalyptus bridgesiana*), Candlebark (*Eucalyptus rubida*, Yellow Box and Broad-leaved Peppermint (*Eucalyptus dives*)) and occurs on low fertility soil. While Yellow Box occurs in this PCT and may be locally abundant over small areas, it is not consistently a dominant species. Neither PCT 3348 nor PCT 3367 are consistent with the floristic composition and soil characteristics of the TEC.
Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (Endangered)	Hill End – Predicted Bathurst – Known Burragorang – Known	Found on plateaus and tablelands. *Eucalyptus viminalis* (Ribbon Gum), *E. radiata* (Narrow-leaved Peppermint), *E. dalrympleana subsp. dalrympleana* (Mountain Gum) and *E. pauciflora* (White Sally) may occur in the community in pure stands or in varying combinations. Typically occurs on loam or clay soils associated with basalt or, less commonly, alluvium, fine-grained sedimentary rocks, granites and similar substrates that produce relatively fertile soils.	Several PCTs in the construction envelope contain *Eucalyptus viminalis* and/or *Eucalyptus pauciflora*. However, these PCTs also contain a variety of eucalypt species that are not associated with the TEC. And most of this vegetation is found on steep hills as opposed to plateau or tableland environments. The soils of the construction envelope are of low fertility and derived from granite, metasediments (e.g. quartzite), and fine-grained sedimentary rock. There is no basalt on or adjacent to the construction envelope. None of the PCTs in the construction envelope are consistent with the floristic composition and soil characteristics of the TEC.

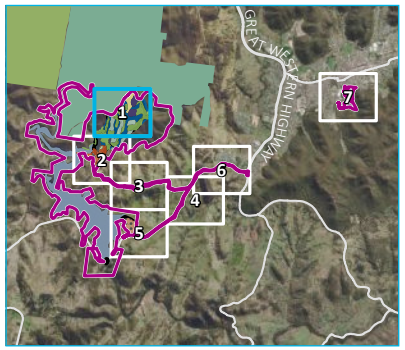
TEC name and status	Known or predicted to occur[1]	Key characteristics of TEC as described in NSW Scientific Committee determinations and associated identification guidelines	Comparison with vegetation of the construction envelope
Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions (Endangered)	Bathurst – Known Burragorang – Known Wollemi – Known	Occurs above 400m in the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands or Australian Alps bioregion. Occurs on generally boggy flat areas near the headwaters of streams. Has a noticeably low number to complete absence of trees Contain more than trace amounts of Sphagnum Moss. Contains shrub and groundcover species consistent with swamp environments as listed in the scientific committee determination for the TEC.	There is no indication that the construction envelope contains any areas that are naturally low in tree cover or treeless. The only relatively flat and poorly drained area in the construction envelope consists of a drainage line containing a thick groundcover of Tall Sedge (*Carex appressa*) and occasional Tussock Grass (*Poa labillardieri*). No Sphagnum Moss nor other characteristic species of the TEC were found in this vegetation which was considered to be derived from the clearing of PCT, which often contains the groundcover species recorded.
Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion (Critically Endangered)	Hill End – Predicted Bathurst - Predicted	Occurs on broad valley floors and the slopes and low rises of the moderately undulating tablelands on a wide variety of substrates including basalt, fine-grained sedimentary rocks, granite, acid volcanics and alluvium. It is characterised by a sparse to very sparse tree stratum dominated by *Eucalyptus pauciflora* either in monospecific stands or with any of *Acacia melanoxylon, E. rubida subsp. rubida, E. stellulata* or *E. viminalis* codominant. A number of other tree species have been recorded within the community, although very infrequently and always as canopy subdominants. These include *E. bridgesiana, E. dives, E. blakelyi and E. melliodora.*	Several PCTs in the construction envelope contain *Eucalyptus pauciflora* in various combinations with a variety of other eucalypts dominant or co-dominant including *E. viminalis, E. rubida, E. bridgesiana, E. melliodora, E. sieberi, E. fastigata* and *E. dives*, most of which are not associated with the TEC. Most of this vegetation is found on steep hills as opposed the broad valley floors and adjacent slopes and low rises associated with the TEC. The tree stratum in these forests and woodlands is moderately dense and could not be described as sparse to very sparse. The soils of the site are of low fertility and derived from granite, metasediments (e.g. quartzite), and fine-grained sedimentary rock. There is no basalt on or adjacent to the construction envelope. None of the PCTs in the construction envelope are consistent with all of the floristic composition, vegetation structure and soil characteristics of the TEC.

TEC name and status	Known or predicted to occur[1]	Key characteristics of TEC as described in NSW Scientific Committee determinations and associated identification guidelines	Comparison with vegetation of the construction envelope
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions (Critically Endangered)	Hill End – Predicted Bathurst - Predicted	Occurs on broad valley floors and gentle slopes and low rises of the moderately undulating Southern Tablelands of NSW. It has been commonly recorded on a wide variety of substrates including basalt, fine-grained sedimentary rocks, granite, acid volcanics and alluvium. Characterised by a sparse to very sparse tree stratum dominated by *Eucalyptus pauciflora* either in monospecific stands or with *E. rubida subsp. rubida* as a co-dominant. A number of other tree species have been recorded within the community, although infrequently and always as canopy subdominants. These include *E. viminalis*, *E. bridgesiana*, *E. dives* and *E. melliodora*.	Several PCTs in the construction envelope contain *Eucalyptus pauciflora* in various combinations with a variety of other eucalypts dominant or co-dominant including *E. viminalis*, *E. rubida*, *E. bridgesiana*, *E. melliodora*, *E. sieberi*, *E. fastigata* and *E. dives*, most of which are not associated with the TEC. In no instances does *Eucalyptus pauciflora* occur as monospecific stands. Nor does *Eucalyptus pauciflora* occur with E. *rubida subsp. rubida* as a co-dominant in the absence of other co-dominant species. Most of this vegetation is found on steep hills as opposed the broad valley floors and adjacent slopes and low rises associated with the TEC. The tree stratum in these forests and woodlands is moderately dense and could not be described as sparse to very sparse. The soils of the site are of low fertility and derived from granite, metasediments (e.g. quartzite), and fine-grained sedimentary rock. There is no basalt on or adjacent to the construction envelope. None of the PCTs in the construction envelope are consistent with all of the floristic composition, vegetation structure and soil characteristics of the TEC.

Note:

1. Known or predicted to occur based on BioNet threatened community profiles.





KEY

- Project area
- Subject land
- Ecology study area
- BAM plot

Plant community type

- Unvegetated

PCT 3211 | Central Tableland Montane Wet Forest

- Moderate

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Moderate

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- High

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest

- High

Existing environment

- NPWS reserve
- State forest

Plant community type

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

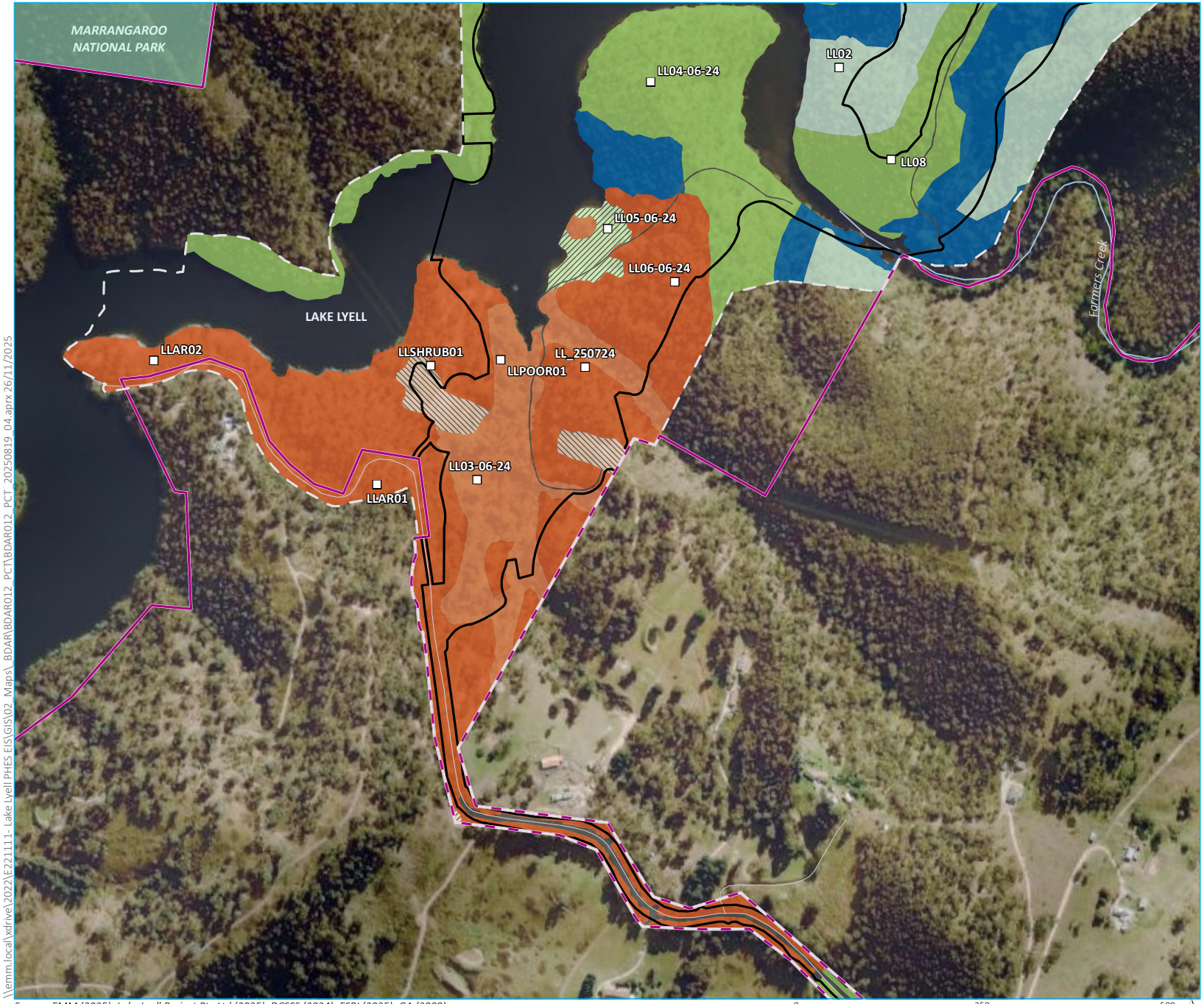
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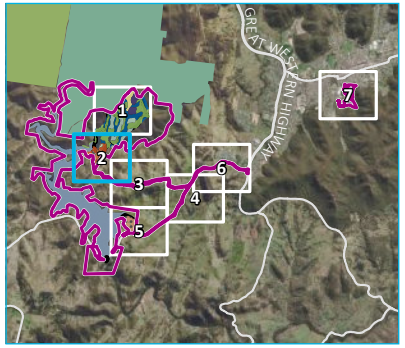
GDA2020 MGA Zone 56

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Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 5.1

EMM
creating opportunities





KEY

- Project area
- Subject land
- Ecology study area
- BAM plot

Plant community type

- Unvegetated
- PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest
  - Derived exotic grass or herbs
- PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
  - Derived exotic grass or herbs
- PCT 3367 | Central Tableland Granites Grassy Box Woodland
  - Moderate
  - Poor
  - Derived shrubland
- PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest
  - Moderate
- PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest
  - High
- PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest
  - High

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest

Plant community type

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 5.1

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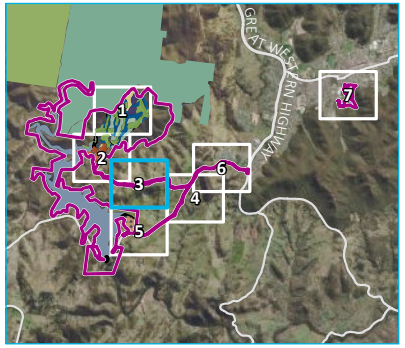
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GDA2020 MGA Zone 56

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EMM
creating opportunities





KEY

- Project area
- Subject land
- Ecology study area
- BAM plot

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest

Plant community type

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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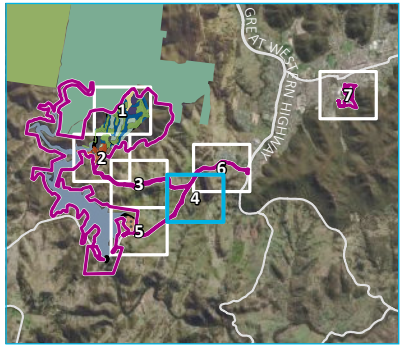
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Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 5.1

EMM
creating opportunities





KEY

- Project area
- Subject land
- Ecology study area
- BAM plot

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs
- Exotic woody vegetation

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

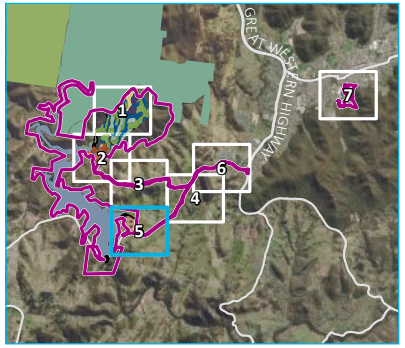
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Plant community type

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 5.1

EMM
creating opportunities





KEY

- Project area
- Subject land
- Ecology study area
- BAM plot

Plant community type

- Unvegetated

PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest

- Derived sedgeland

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Plant community type

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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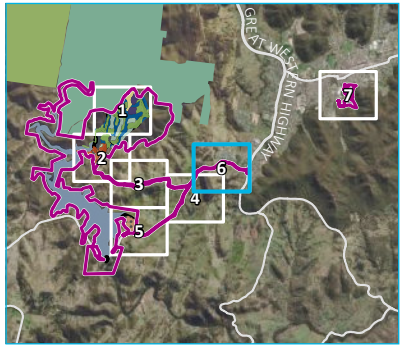
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Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 5.1

EMM
creating opportunities





KEY

- Project area
- Subject land
- Ecology study area
- BAM plot

Plant community type

- Planted non-indigenous native plants
- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Exotic woody vegetation

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- Moderate

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Plant community type

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 5.1

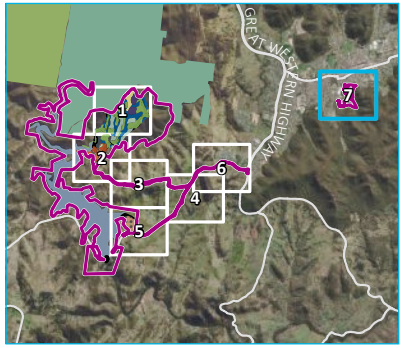
EMM
creating opportunities

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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KEY

- Project area
- Subject land
- Ecology study area
- BAM plot

Plant community type

- Unvegetated

PCT 3385 | Southern Tableland Creekflat Swamp Woodland

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3687 | Newnes Plateau Peppermint-Ash Tall Forest

- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment

- Major road
- Minor road
- NPWS reserve
- State forest

Plant community type

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 5.1

EMM
creating opportunities

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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GDA2020 MGA Zone 56
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6 Threatened species

6.1 Threatened species habitat description

Concurrent with the vegetation mapping, a habitat assessment was undertaken seeking to identify the following threatened species habitat features within the construction envelope:

- habitat trees including large hollow bearing trees
- availability of key food plant species
- waterway condition
- quantity of surface rock
- quantity of ground litter and logs
- presence of large rock outcrops, cliffs, caves and large crevices
- searches for indirect evidence.

The majority of the construction envelope is vegetated with disturbance limited to areas where there has been historical use for logging, agricultural and infrastructure development activities in areas of lower elevation. These areas subject to human disturbance show more evidence of impacts to biodiversity values, including a higher abundance of weed species. These areas also contain far fewer mature trees that support hollows, even in areas with relatively steep slopes.

The construction envelope contains an abundance of fauna habitat features such as small rock outcrops, scattered surface rock, large woody debris, and large hollow-bearing trees and gorges, suitable to provide refuge habitat for several threatened species. Hollow bearing trees are mostly restricted to the steep hillsides and rocky areas, at higher elevation that have not been extensively cleared for agriculture or timber extraction. Features, such as fallen timber, are prevalent throughout the construction envelope. The core of the construction envelope has a high level of connectivity with surrounding National Parks estate and forested private properties.

Vegetation in the construction envelope was not affected by the 2019/2020 Gosper's Mountain bushfires and does not appear to have been burnt in several decades or more. Hence, fauna habitat provided be vegetation in the construction envelope is generally in good condition, especially compared to vast areas in the Blue Mountains region that were severely burnt during the 2019/2020 bushfire.

Vegetation in the construction envelope predominantly comprises dry sclerophyll open forests and woodlands with only small areas of wetter sclerophyll forests generally restricted to protected slopes at higher altitude, closer to Mount Walker. Species associated with taller, wetter forests are likely to be restricted to this higher altitude, sheltered areas.

Sheltered areas at higher elevation, on upper slopes to the north of Lake Lyell, provide a cooler climate and support tall forests with a moderately dense grass and forb groundcover and moderate shrub and sub-canopy tree density. These tall forests typically provide suitable coverage for fauna species associated with open forest habitats. These areas also contained the largest number of mature trees with hollows and hence are considered suitable to support a high density of hollow-dependant animals. Steep and exposed areas with rocky soil were drier with lower, more open canopy and groundcover dominated by grasses, sclerophyll forbs and sparse small shrubs.

The generally sparse shrub layer of the site has a low diversity and abundance of nectar-producing shrubs such as Grevillea or Banksia species that often provide nectar resources for small birds and arboreal mammals. Foraging opportunities for seed-eating, and fruit-eating species appear to be greater due to the presence of a variety of Eucalyptus species, Acacia species and *Persoonia linearis*. The fruits of Persoonia species are utilised by both fruit-eating and seed-eating species and were observed to form part of the diet of several parrot species in the construction envelope, including the Gang-gang Cockatoo.

Trees and shrub species in the family Casuarinaceae (she-oaks, etc.) are generally scarce, and restricted to scattered occurrences of a few individuals, with the exception of a single dense patch of *Allocasuarina littoralis* (Black She-oak) within the construction envelope in the location of the upper reservoir. Glossy Black Cockatoos were observed foraging in this patch on several occasions.

Some areas have been historically cleared of all native woody vegetation for agriculture and other human activities, particularly in the location of the proposed accommodation camp and around Sir Thomas Mitchell Drive.

Small valleys in the construction envelope contain ephemeral waterways that only flow during and shortly after rainfall and contain only very small ephemeral pools. These waterways provide habitat for some small frog species, such as Common Eastern Froglet (*Crinia signifera*) that are able to breed in ephemeral pools but are unsuitable for stream-dwelling animal species.

The water body and edges of Lake Lyell provide foraging habitat and cover for a variety of native species of waterbirds, reptiles and mammals. Within the project area, shallow water and exposed muddy habitat, of a type typically utilised by wading birds, is generally absent from the steep margins of the water body, limiting its potential as habitat for threatened and/or migratory wading birds. Such habitat is also scarce around the fringes of Lake Lyell during typical, full supply level conditions. This limited habitat suitability appears to be reflected in limited records of threatened and/or migratory wading birds. For instance, single individuals of Latham's Snipe (*Gallinago hardwickii*) which is listed as Vulnerable and Migratory under the EPBC Act were recorded at Lake Lyell in 2012 and 2018. The Blue-billed Duck (*Oxyura australis*) which is listed as Vulnerable under the BC Act, was recorded at Lake Lyell in 2014. White-bellied Sea-Eagles (*Haliaeetus leucogaster*), listed as Vulnerable under the BC Act, have been recorded at Lake Lyell in 2023 and 2024.

Within the construction envelope, the fringes of Lake Lyell contain minimal emergent aquatic vegetation and the water body contains a mixed assemblage of native and introduced fish species. Due to these characteristics, it is of limited potential as frog habitat, and only likely to provide marginal habitat for common and disturbance-tolerant frogs.

There are no farm dams in the construction envelope that, if present, could provide breeding habitat for pond-dwelling frog species. A single large puddle that holds water for several weeks after rain was the only pond-like habitat observed as is located at the edge of a vehicle track, under the power transmission line that runs through the lower part of the construction envelope, south of Farmers Creek. Three common frog species, Common Eastern Froglet, Spotted Grass Frog (*Limnodynastes tasmaniensis*), and Whistling Tree Frog (*Litoria verreauxii*) were observed in and around this puddle.

There are no large nor permanently flowing streams in the construction envelope. The more natural flowing sections of Farmers Creek upstream of the construction envelope and natural areas of the Cox's River upstream of the project area, may provide suitable habitat for a variety of stream-dwelling species including Booroolong Frog (*Litoria booroolongensis*), listed as Endangered under the BC Act and EPBC Act. However, these areas are unlikely to be affected by the project.

6.2 Ecosystem credit species

Ecosystem credit species are threatened species that can be reliably predicted to use an area of land based on habitat surrogates. For the purposes of the BAM (DPIE 2020a), ecosystem credit species are deemed to be offset through the habitat surrogates (PCTs) in which they occur.

A list of ecosystem credit species predicted to occur within the construction envelope, based on the PCTs present and generated by the calculator associated within the BAM is provided in Table 6.1. The potential for these species to occur within the construction envelope was assessed in accordance with section 5.2.2 of the BAM (DPIE 2020a).

Table 6.1 Assessment of ecosystem credit species within the construction envelope

Scientific name	Common name	IBRA subregion[1]				Associated PCTs	Habitat and geographic constraints (if any)	Justification for addition or exclusion
		Hill End	Bathurst	Burragorang	Wollemi			
Anthochaera phrygia	Regent Honeyeater	Hill End	Bathurst	-	-	3367	-	Excluded from Exotic, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and only a very low diversity of disturbance-tolerant native ground layer plants. They are unlikely to have any greater value to the species than cleared land and modification to these areas would have negligible impact on the species. Included elsewhere.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Hill End	Bathurst	Burragorang	3687	3211, 3347, 3348, 3367,3369, 3385, 3650, 3735, 3747	-	As above.
Callocephalon fimbriatum	Gang-gang Cockatoo (Foraging)	Hill End	Bathurst	Burragorang	3687	3211, 3348, 3367, 3369, 3385, 3650, 3735, 3747	-	As above.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo (Foraging)	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	Presence of Allocasuarina and casuarina species	As above.
Chthonicola sagittata	Speckled Warbler	Hill End	Bathurst	Burragorang	Wollemi	3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Circus assimilis	Spotted Harrier	Hill End	Bathurst	Burragorang	-	3347, 3348, 3367, 3369, 3385	-	As above.

Scientific name	Common name	IBRA subregion[1]				Associated PCTs	Habitat and geographic constraints (if any)	Justification for addition or exclusion
		Hill End	Bathurst	Burragorang	Wollemi			
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Hill End	Bathurst	Burragorang	Wollemi	3211, 3348, 3367, 3369, 3385, 3650, 3687, 3747, 3735	-	As above.
Daphoenositta chrysoptera	Varied Sittella	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Dasyurus maculatus	Spotted-tailed Quoll	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Ephippiorhynchus asiaticus	Black-necked Stork	-	-	-	Wollemi	3687	No. No suitable waterbodies (swamps, lake margins, etc.) present on or within 300 m of the construction envelope	As above.
Falco subniger	Black Falcon	Hill End	Bathurst	-	-	3347, 3348, 3367, 3369, 3735, 3747	-	As above.
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Hill End	Bathurst	Burragorang	-	3211, 3347, 3369, 3650, 3687, 3735, 3747	-	As above.
Glossopsitta pusilla	Little Lorikeet	Hill End	Bathurst	-	-	3211 ,3347, 3348, 3367, 3369, 3650, 3735, 3747	-	As above.
Grantiella picta	Painted Honeyeater	Hill End	Bathurst	-	Wollemi	3211, 3367, 3369, 3650, 3687, 3735, 3747	Yes. Mistletoes present at a density of greater than five mistletoes per hectare in some areas.	As above.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Foraging)	Hill End	Bathurst	-	Wollemi	3211, 3347, 3348, 3367, 3369, 3650, 3687, 3735, 3747	Waterbodies Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines	As above.

Scientific name	Common name	IBRA subregion[1]				Associated PCTs	Habitat and geographic constraints (if any)	Justification for addition or exclusion
		Hill End	Bathurst	Burragorang	Wollemi			
Hamirostra melanosternon	Black-breasted Buzzard (Foraging)	-	-	-	Wollemi	3687	-	As above.
Hieraaetus morphnoides	Little Eagle (Foraging)	Hill End	Bathurst	Burragorang	Wollemi	3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Hirundapus caudacutus	White-throated Needletail	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Lathamus discolor	Swift Parrot (Foraging)	Hill End	Bathurst	Burragorang	Wollemi	3347, 3348, 3367, 3369, 3650, 3687, 3735, 3747	-	As above.
Lophoictinia isura	Square-tailed Kite (Foraging)	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Melanodryas cucullata cucullata	South-eastern Hooded Robin	Hill End	Bathurst	Burragorang	Wollemi	3211, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Melithreptus gularis gularis	Black-chinned Honeyeater (eastern subspecies)	Hill End	Bathurst	Burragorang	Wollemi	3367, 3369, 3650, 3687, 3735, 3747	-	As above.
Miniopterus orianae oceanensis	Large Bent-winged Bat (Foraging)	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Petaurus australis	Yellow-bellied Glider	Hill End	Bathurst	Burragorang	Wollemi	3211, 3650, 3687, 3735	-	As above.
Petroica boodang	Scarlet Robin	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.
Petroica phoenicea	Flame Robin	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	As above.

Scientific name	Common name	IBRA subregion[1]				Associated PCTs	Habitat and geographic constraints (if any)	Justification for addition or exclusion
		Hill End	Bathurst	Burragorang	Wollemi			
Polytelis swainsonii	Superb Parrot (Foraging)	Hill End	Bathurst	-	-	3367, 3369, 3735	-	As above.
Pomatostomus temporalis temporalis	Grey-crowned Babbler (eastern subspecies)	Hill End	-	-	-	3348, 3347	-	As above.
Pteropus poliocephalus	Grey-headed Flying-fox (Foraging)	Hill End	Bathurst	Burragorang	Wollemi	3211, 3347, 3348, 3367, 3369, 3687, 3735, 3747	-	As above.
Pycnoptilus floccosus	Pilotbird	-	-	Burragorang	Wollemi	3687	Absent Restricted to Wollemi NP (in Wollemi subregion)	As above.
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	Hill End	Bathurst	-	-	3367, 3747	-	As above.
Scoteanax rueppellii	Greater Broad-nosed Bat	Hill End	Bathurst	-	-	3211, 3650	-	As above.
Stagonopleura guttata	Diamond Firetail	Hill End	Bathurst	Burragorang	-	3347, 3348, 3367, 3369, 3385, 3650, 3735, 3747	-	As above.
Varanus rosenbergi	Rosenberg's Goanna	Hill End	Bathurst	Burragorang	Wollemi	3347, 3348, 3367, 3687	-	As above.

6.3 Species credit species

6.3.1 Candidate species assessment

In accordance with Step 3 (section 5.2.3 of BAM (DPIE 2020a)), an assessment of habitat constraints and microhabitats was undertaken in the field to determine the suitability of habitat within the construction envelope for:

- predicted species (ecosystem credit species associated with recorded PCTs, predicted by the BAM Calculator (BAMC))
- candidate species (species credit species associated with specific geographic and landscape feature constraints)
- species predicted to occur by the EPBC Act Protected Matters Search Tool.

Candidate species predicted by the BAM-C are shown in Table 6.2. An assessment of the geographic and landscape constraints has been provided for each species, with a justification provided where species have been excluded, in accordance with Steps 1 to 3 (section 5.2.1 to 5.2.3) of the BAM.

Table 6.2 Candidate threatened species assessment

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints									Step 3 – Identify candidate species for further assessment
Scientific name	Common name	Associated PCTs in associated IBRA regions	Habitat and geographic constraints	Habitat degraded	Associated with PCT/s and IBRA subregion/s				Vagrant species	Constraint present in construction envelope?	Candidate species (included/excluded) and rationale
					Hill End	Bathurst	Burragorang	Wollemi			
Flora											
Acacia flocktoniae	Flockton Wattle	3650	-	-	-	Yes	-	-	-	-	Included. Included in all occurrences of associated PCT/s in associated IBRA subregions.
Acacia meiantha	-	3747	-	Yes. In some zones.	Yes	-	-	-	-	-	Included. Included in all occurrences of associated PCT/s in associated IBRA subregions.
Asterolasia buxifolia	-	3348	-	Yes. In some zones.	-	Yes	-		-	-	Included in better condition areas. Included in Moderate and DNG vegetation zones. Excluded from Exotic, DNG_Poor and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25) and the lack of a native shrub layer in these areas.
Boronia deanei	Deane's Boronia	3687	Check • Riparian areas and drainage lines or within 100 m • Swamps; Margins of swamps or within 100 m	Yes.			Yes	Yes	-	-	Excluded from entire project. Excluded from most of PCT 3687 in areas > 100 m from riparian areas, drainage lines or swamps. Excluded from DEGH zone due to high soil disturbance (soil translocated and/or subject to substantial earthworks or highly modified by pasture improvement and increased nutrients), low vegetation integrity scores (VI score <25) and the lack of a diverse native shrub layer in these areas.
Caesia parviflora var. minor	Small Pale Grass-lily	3687	-	Yes.	-	-	-	Yes	-	-	Excluded from entire project. Excluded from 3687_DEGH zone (2.85 ha with a VI score of 16.4) due to high soil disturbance (soil translocated and/or subject to substantial earthworks or highly modified by pasture improvement and increased nutrients). Also excluded from 3687_Poor (0.05 ha with VI score of 26.1) and 3687_DNG_Poor (0.03 ha with VI score of 20.4) zones due to the low diversity of forbs and high level of weed invasion in these areas. According to the TBDC the species habitat includes ”damp places in open forest on wet heathland on sandstone and sand”. The areas of PCT 3687 in the construction envelope are not on moist sandstone or sand substrate and are unlikely to be suitable as habitat.
Caladenia attenuata	Duramana Fingers	None	-	-	-	-	-	-	-	-	Excluded from entire project It is not a candidate species as it is not associated with any of the PCTs found in the construction envelope and so does not require survey. It was included in the project scoping report and SEARs based on uncertainty regarding preliminary information. The species has not been recorded within the surrounding area and has a highly restricted recorded distribution, with the nearest record more than 50 km from the construction envelope (ALA 2025). The species was searched for during targeted surveys in spring for other plant species. Several other Caladenia species (*Caladenia mentiens, Caladenia moschata, Caladenia carnea*) were found but none were a match for the species.
Eucalyptus aggregata	Black Gum	3347, 3348, 3385	-	Yes. In some zones.	Yes	Yes	Yes	Yes	-	-	Included in Moderate, Poor and DNG vegetation zones. Excluded from Exotic, DNG_Poor, Sedge and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25) and the lack of a native trees layer in these areas.
Eucalyptus cannonii	Capertee Stringybark	3369, 3735, 3747	-	-	Yes	-	-	-	-	-	Included. Included in all occurrences of associated PCT/s in associated IBRA subregions.

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints									Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Associated PCTs in associated IBRA regions**	**Habitat and geographic constraints**	**Habitat degraded**	**Associated with PCT/s and IBRA subregion/s**				**Vagrant species**	**Constraint present in construction envelope?**	**Candidate species (included/excluded) and rationale**
					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Eucalyptus pulverulenta	Silver-leafed Gum	3347, 3348, 3367, 3650	-	Yes. In some zones.	Yes	Yes	-	-	-	-	Included in Moderate, High, Shrub and DNG vegetation zones. Excluded from Exotic, DNG_Poor, Sedge and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25) and the lack of a native shrub layer in these areas.
Eucalyptus robertsonii subsp. hemisphaerica	Robertson's Peppermint	3735, 3747	-	Yes. In some zones.	Yes	Yes	-	-	-	-	Included in Moderate and DNG vegetation zones. Excluded from Exotic, DNG_Poor, Sedge and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25) and the lack of a native shrub layer in these areas.
Grevillea divaricata	-	None	-	-	-	-	-	-	-	-	Excluded from entire project. It is not a candidate species as it is not associated with any of the PCTs found in the construction envelope and does not require survey but was included in the project SEARs based on preliminary information. The species has not been recorded within the surrounding area and has a highly restricted recorded distribution with the nearest record more than 45 km from the construction envelope (ALA 2025). The species was searched for during targeted surveys for other plant species. No plants even superficially resembling the species were recorded in the construction envelope.
Leucochrysum albicans var. tricolor	Hoary Sunray	3347, 3348, 3747	-	Yes. In some zones.	Yes	Yes	-	-	-	-	Included in Moderate, High and DNG vegetation zones. Excluded from Exotic, DNG_Poor and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25) and the lack of a diverse native forb layer in these areas.
Persoonia hindii	Persoonia hindii	3687	-	Yes	-	-	-	Yes	-	-	Excluded. Excluded from 3687_DEGH zone due to high soil disturbance (soil translocated and/or subject to substantial earthworks or highly modified by pasture improvement and increased nutrients). Also excluded from 3687_Poor (0.05 ha) and 3687_DNG_Poor (0.03 ha) zones due to the low diversity of forbs and high level of weed invasion- in these areas.
Persoonia marginata	Clandulla Geebung	3369, 3687, 3735, 3747	-	Yes. In some zones	Yes	Yes	Yes	Yes	-	-	Included in Moderate, High and DNG vegetation zones. Excluded from Exotic, DNG_Poor and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25) and the lack of a diverse native shrub layer in these areas.
Pomaderris cotoneaster	Cotoneaster Pomaderris	None	-	-	-	-	-	-	-	-	Excluded from entire project. It is not a candidate species as it is not associated with any of the PCTs found in the construction envelope and does not require survey. It was included in the project scoping report and SEARs based on uncertainty regarding preliminary information. The species has not been recorded within the surrounding area; the nearest records are located over 30 km from the construction envelope (ALA 2025). The species was searched for during targeted surveys for other plant species. The only plants even superficially resembling the species in the construction envelope were two other *Pomaderris* species, *Pomaderris elliptica* and *Pomaderris betulina*.
Rhizanthella slateri	Eastern Australian Underground Orchid	None	-	-	-	-	-	-	-	-	Excluded from entire project. It is not a candidate species as it is not associated with any of the PCTs found in the construction envelope nor with the relevant IBRA subregions. It was included in the project scoping report and SEARs based on uncertainty regarding preliminary information. The species has not been recorded within the surrounding area; the nearest records are located over 30 km from the construction envelope (ALA 2025).
Thesium australe	Austral Toadflax	3348		Yes. In some zones.	-	Yes	-	-	-	-	Included in Moderate, High and DNG vegetation zones. Excluded from Exotic, DNG_Poor and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25), absence or very low abundance of associated grass species (Themeda triandra) and the lack of a diverse native forb layer in these areas.

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints									Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Associated PCTs in associated IBRA regions**	**Habitat and geographic constraints**	**Habitat degraded**	**Associated with PCT/s and IBRA subregion/s**				**Vagrant species**	**Constraint present in construction envelope?**	**Candidate species (included/excluded) and rationale**
					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Veronica blakelyi	-	3211, 3369, 3687, 3735	-	Yes. In some zones	Yes	Yes	Yes	Yes	-	-	Included in better condition areas. Excluded from Exotic, DNG_Poor and DEGH zones due to high soil disturbance, low vegetation integrity scores (VI score <25) and the lack of a diverse native forb layer in these areas.
Zieria obcordata	Granite Zieria	None	-	-	-	-	-	-	-	-	Excluded from entire project. It is not a candidate species as it is not associated with any of the PCTs found in the construction envelope and does not require survey. It was included in the project scoping report and SEARs based on uncertainty regarding preliminary information. The species has not been recorded within the surrounding area and has a highly restricted recorded distribution. The nearest records are located over 50 km from the construction envelope (ALA 2025). The species was searched for during targeted surveys for other plant species. The only plants observed even superficially resembling the species were *Zieria cytisoides*.
Fauna											
Anthochaera phrygia	Regent Honeyeater	3367	• As per Important Habitat Map.	-	Yes	Yes	-	-	-	-	Excluded from entire project. No survey required. The species is assessed for species credits via the Important Habitat Map in BOAMS. The site is not within the important habitat area.
Aprasia parapulchella	Pink-tailed Legless Lizard	3347, 3735, 3747	• Rocky areas, or within 50 m of rocky areas.	-	Yes	Yes	-	-	-	Yes	Included. The Pink-tailed Legless Lizard habitat includes primary and secondary grassland, grassy woodland and woodland communities, and the species usually inhabits sloping sites that contain rocky outcrops or scattered, partially buried rocks (TSSC 2015a). The structurally intact areas of habitat in the construction envelope are considered marginal based on their forest structure with relatively high canopy cover as opposed to the grassland or open grassy woodland structure associated with the species. Derived native grassland and exotic grassland areas in the construction envelope (roadsides and highly modified native and exotic grasslands) are likely derived from forest with relatively dense canopy cover, contain very few rocks, are in many areas physically disturbed, and are also at best marginal as habitat. The construction envelope is outside of the species' known distribution. The nearest recorded location of the species is more than 40 km north-west of the construction envelope (ALA 2025). Based on the Species of National Environmental Significance (public grids), the construction envelope is within the species' predicted (likely to occur) distribution (DCCEEW 2025). The construction envelope is entirely within approximately 5-12 km of the eastern edge of the 'likely to occur' area (DCCEEW 2025). It should be noted that the 'likely to occur' area is generalised to a 10 km resolution and appears to be a very conservative model, including some areas that are more than 150 km from the nearest recorded location of the species (DCCEEW 2025, ALA 2025). Despite the low likelihood that the construction envelope contains habitat for the species, it was included in areas of associated PCTs containing rocky areas and within 50 m of rocky areas. It was also included in PCT 3367 as that PCT was considered more suitable as habitat than the PCTs associated with the species, based on its more open structure and less steep terrain. Excluded elsewhere.
Burhinus grallarius	Bush Stone-curlew	3348, 3367, 3747	• Fallen/standing dead timber including logs.	Yes. In some zones.	Yes	Yes	-	(DEGH) zones.	-	Yes	Included in area containing habitat constraint. Microhabitat: Open forests and woodlands with a sparse grassy ground-layer and fallen timber. The majority of vegetation zones within construction envelope support fallen/standing dead timber including logs. Areas of derived shrubland, DNG and exotic grassland vegetation zones lack suitable habitat such as fallen timber and are unlikely to be suitable for this species. Species excluded from DNG, derived shrubland (Shrub), DNG and exotic grassland.

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints								Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Associated PCTs in associated IBRA regions**	**Habitat and geographic constraints**	**Habitat degraded**	**Associated with PCT/s and IBRA subregion/s**				**Vagrant species**	**Constraint present in construction envelope?**	**Candidate species (included/excluded) and rationale**
					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Callocephalon fimbriatum	Gang-gang Cockatoo (Breeding)	3211, 3347, 3348, 3367, 3369, 3385 3650, 3687, 3735, 3747	• Hollow bearing trees - Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger.	-	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Included in zones containing hollow-bearing trees with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger. Excluded from zones lacking the habitat constraint; derived shrubland, DNG and exotic grassland areas.
Calyptorhynchus lathami	South-eastern Glossy Black-Cockatoo (Breeding)	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Hollow bearing trees - Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground.	-	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Included in zones containing hollow-bearing trees with hollows at least 8 m above the ground and with hollow diameter of 15 cm or larger. Excluded from zones lacking the habitat constraint; derived shrubland, DNG and exotic grassland areas.
Cercartetus nanus	Eastern Pygmy-possum	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	Yes. In some zones.	Yes	Yes	Yes	Yes	-	-	Included in better condition areas. Microhabitat: Woody vegetation with sheltering sites and a substantial component of food resources such as nectar and pollen from banksias, eucalypts and bottlebrushes or fleshy fruits. Derived native grassland (DNG), derived sedgeland (Sedge), exotic grassland (DEGH), and Exotic zones provide very limited shelter or food resources due to a lack of hollow bearing trees or other potential shelter and/or the absence of a diverse suite of tree and shrub species and associated food resources. Species excluded from Derived native grassland (DNG), derived sedgeland (Sedge), exotic grassland (DEGH), and Exotic zones.
Chalinolobus dwyeri	Large-eared Pied Bat	3211, 3347, 3348, 3367, 3369, 3650, 3687, 3735, 3747	• Cliffs. Within 2 km of rocky areas containing caves, overhangs, escarpments, outcrops, or crevices, or within 2 km of old mines or tunnels.	-	Yes	Yes	Yes	Yes	-	Yes Habitat constraint absent from construction envelope but present within two kilometres.	Included in area containing habitat constraint. Microhabitat: Found in well-timbered areas containing gullies. Probably forages for small, flying insects below the forest canopy. The construction envelope does not contain any caves, overhangs or escarpments. Rocky outcrops in the construction envelope are at or near ground level and do not contain crevices of sufficient size to act as roosts for microbats. Some rock outcrops with large crevices are found within 2 km of parts of the construction envelope. The species is included in these areas which cover all areas of associated PCTs in the construction envelope. Due to their lack of woody vegetation and associated habitat complexity and relatively low attractiveness to likely prey species (small flying insects), Derived Native Grassland (DNG) and exotic grassland (DEGH) vegetation zones are likely to be of low value as foraging habitat for the species. Species from excluded from Derived Native Grassland (DNG) and exotic grassland (DEGH) vegetation zones.

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					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Delma impar	Striped Legless Lizard	3347, 3348, 3367, 3369	-	Yes.	-	Yes	-	-	-	-	Excluded from entire project. The Striped Legless Lizard is a grassland specialist, found only in areas of naturally-occurring native grassland and nearby grassy woodland, derived native grassland and exotic pasture (TSSC 2016). The species is typically restricted to grasslands but is not restricted to native or primary grassland. The presence of a relatively dense and continuous tussock grass structure, rather than the floristic composition of the grasslands, may be important in influencing the persistence of the species (Smith & Robertson 1999). The species is found mainly in Natural Temperate Grassland but is also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming native grasses and sometimes present in modified grasslands with a significant content of exotic grasses (BCS 2025b). The woodland / forest and grassland habitat in the construction envelope is not located adjacent to any area that currently supports or is likely to have previously supported naturally occurring native grassland according to the pre-clearing State Vegetation Type Map (NSW DCCEW 2025b). It typically has a moderately dense canopy cover and is unlikely to have an open enough structure to support the species. The habitat in the construction envelope is considered unsuitable based on vegetation structure. The construction envelope is outside of the species' known or predicted distribution. The nearest record of the species is more than 130 km from the construction envelope (ALA 2025, Bionet 2025). It is outside of the expert distribution 'maybe' and 'likely' distribution areas by approximately 100 km (ALA 2025). It is also well outside of the indicative distribution "may occur" area displayed in the species' EPBC Act conservation advice (TSSC 2016). The species distribution mapping 'may occur' category aims to capture the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species and was created using an extensive database of species observations records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research (TSSC 2016). The construction envelope does not contain any suitable habitat for the species and is outside of the modelled distribution (broad environmental envelope or geographic region that could provide habitat for the species). It is considered very unlikely to occur in the construction envelope and is therefore considered a vagrant species for the purposes of this assessment and excluded from further consideration.
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Waterbodies. • Within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	-	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Trees potentially suitable as nesting sites for this species are found in the construction envelope within 1 km of waterbodies. Large trees were absent within DNG and exotic grassland vegetation zones. Species excluded from DNG and exotic grasslands and all lands >1 km from waterbodies, rivers, lakes, large dams or creeks, wetlands and coastlines.
Hamirostra melanosternon	Black-breasted Buzzard (Breeding)	3687	• Waterbodies; Land within 40 m of riparian woodland on inland watercourses / waterholes containing dead or dying eucalypts.	-	-	-	-	Yes	Yes	No	Excluded from entire project. Excluded from 3687 which is only represented by derived exotic grassland, does not contain dead or dying eucalypts, and is not located within 40 m of riparian woodland on inland watercourses/waterholes.

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					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Heleioporus australiacus	Giant Burrowing Frog	3687	-	Yes.	-	-	Yes	Yes	-	-	Excluded from entire project Excluded from 3687_DEGH zone due to high soil disturbance (soil translocated and/or subject to substantial earthworks or highly modified by pasture improvement). Also excluded from 3687_Poor (0.05 ha) and 3687_DNG_Poor (0.03 ha) zones due to the cleared and simplified ground layer in these areas.
Hieraaetus morphnoides	Little Eagle (Breeding)	3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Nest trees – live (occasionally dead) large old trees within vegetation).	-	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Species was included in surveys but has since been excluded from further assessment for species credits as no nest trees or other signs of breeding activity found within the construction envelope or a 100 m buffer surrounding the construction envelope. Large trees were absent within DNG and exotic grassland vegetation zones. Species excluded from DNG and exotic grasslands.
Lathamus discolor	Swift Parrot (Breeding)	3347, 3348, 3367, 3369, 3650, 3687, 3735, 3747	• As per Important Habitat Map.	-	Yes	Yes	Yes	Yes	-	No	Excluded from entire project. No survey required. The species is assessed for species credits via the Important Habitat Map in BOAMS. The site is not within the important habitat area.
Litoria aurea	Green and Golden Bell Frog	3347, 3348, 3367, 3369	• Semi-permanent / ephemeral wet areas. • Within 1 km of wet areas / swamps. • Within 1 km of swamp / waterbodies.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Excluded from entire project. Microhabitat: Suitable breeding habitat consists of any still, shallow, unshaded waterbody with abundant emergent aquatic vegetation and typically free of the plague minnow (*Gambusia holbrooki*) and other exotic predatory fish (DAWE 2014, Fardell et. al 2018). Foraging habitat and movement/dispersal habitat are areas of native and non-native vegetation with suitable moist microclimatic conditions located adjacent to breeding areas (DPIE 2020c). construction envelope does not contain any waterbody with a substantial amount of emergent aquatic vegetation considered suitable for support this species. Very little emergent aquatic vegetation is found along the periphery of Lake Lyell. The reservoir contains a variety of predatory exotic fish, such as Rainbow Trout and Redfin Perch, and so is unlikely to be suitable as habitat. Although there is potential habitat for the species in well-vegetated farm dams on private property within 1 km of the construction envelope that could not be accessed for survey, if a 200 m buffer was applied from the top of the bank from these waterbodies, it would not intersect with the construction envelope. A 200 m buffer around aquatic habitat defines the species polygon for the species as described in the NSW Survey Guide for Threatened Frogs (DPIE 2020c). The construction envelope is outside of the species' known or predicted distribution; it is outside of the expert distribution 'maybe' distribution by about 28 km and 'likely' distribution areas by approximately 46 km (ALA 2025). The nearest record of the species is more than 30 km from the construction envelope (ALA 2025). The species is considered very unlikely to occur on in the construction envelope both on the basis that it should be considered vagrant in the locality (locally extinct) and that the waterbodies present are highly degraded.

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints								Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Associated PCTs in associated IBRA regions**	**Habitat and geographic constraints**	**Habitat degraded**	**Associated with PCT/s and IBRA subregion/s**				**Vagrant species**	**Constraint present in construction envelope?**	**Candidate species (included/excluded) and rationale**
					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Litoria booroolongensis	Booroolong Frog	3347, 3348, 3367, 3369, 3385, 3650, 3735, 3747	-	Yes	Yes	Yes	Yes	-	-	-	Excluded from entire project. Microhabitat: the species requires permanent, or near permanent river environment with rocky structures (bedrock or cobble). Suitable breeding habitat consists of rocky structures in shallow water along the riparian zone, and non-breeding habitat is any habitat within the riparian zone (generally within 50 m of the high water mark) (DPIE 2020c). The construction envelope does not contain permanent or near permanent, flowing streams or rivers considered suitable to support this species. Some potential habitat is located in upstream parts of Coxs River and Farmers Creek. The areas of waterway within the project area are inundated by Lake Lyell and do not contain suitable following rocky stream habitat. The only possibly suitable habitat near the disturbance footprint is separated from it by a ridgeline, and a distance of approximately 50 m, ensuring no direct impact on the species and that any potential surface water impact is only likely to occur downstream of potential habitat for the species, in an area that is already inundated by Lake Lyell and unlikely to support the species. The species is considered very unlikely to occur on in the construction envelope on the basis that the waterbodies present are unsuitable as habitat and/or highly degraded.
Litoria castanea	Yellow-spotted Tree Frog	3367, 3369, 3385, 3747	-	Yes	Yes	Yes	-	-	Yes	-	Excluded from entire project. Microhabitat: Suitable breeding and non-breeding habitat consists of any waterbody with emergent aquatic vegetation and preferably does not contain the plague minnow (*Gambusia holbrooki*). Foraging habitat and movement/dispersal habitat are areas of native and nonnative vegetation (DPIE 2020c). The construction envelope does not contain any waterbody with a substantial amount of emergent aquatic vegetation considered suitable for support this species. Very little emergent aquatic vegetation is found along the periphery of Lake Lyell. The reservoir contains a variety of predatory exotic fish, such as Rainbow Trout and Redfin Perch, and so is unlikely to be suitable as habitat. Although there is potential habitat for the species in well-vegetated farm dams on private property within 1 km of the construction envelope that could not be accessed for survey, if a 200 m buffer was applied from the top of the bank from these waterbodies, it would not intersect with the construction envelope. A 200 m buffer around aquatic habitat defines the species polygon for the species as described in the NSW Survey Guide for Threatened Frogs (DPIE 2020c). The construction envelope is outside of the species' known or predicted distribution; it is outside of the expert distribution 'maybe' and 'likely' distribution areas by approximately 27 km (ALA 2025). The nearest record of the species is more than 30 km from the construction envelope (ALA 2025). The species is considered very unlikely to occur on in the construction envelope both on the basis that it should be considered vagrant in the locality and that the waterbodies present are highly degraded.

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Litoria littlejohni	Littlejohn's Tree Frog	3211, 3347, 3348	-	Yes	-	Yes	-	-	-	-	Excluded from entire project. The species breeds in the upper reaches of permanent streams and in perched swamps, being rock pools on sandstone, and peaty pools. Non-breeding habitat is heath-based forests and woodlands where individuals shelter under leaf litter and low vegetation. Suitable breeding habitat consists of a range of still or slow-moving waterbodies including permanent streams, pools, ponds, swamps and dams, located within areas of suitable native vegetation. Non-breeding habitat is native vegetation located within 300 m of breeding sites, through which the species can migrate to locate non-breeding habitat (DPIE 2020c). The construction envelope does not contain the upper reaches of any permanent or near permanent streams or any perched swamps. Nor are any such features found within 300 m of the construction envelope. There are no heath-based forests or woodlands in the construction envelope. The species is considered very unlikely to occur on in the construction envelope on the basis that the waterbodies present are unsuitable as habitat and/or highly degraded.
Litoria raniformis	Southern Bell Frog	3347, 3348, 3367, 3369, 3735, 3747	-	Yes	-	Yes	-	-	Yes	-	Excluded from entire project Microhabitat: Suitable breeding and non-breeding habitat consists of any waterbody with emergent aquatic vegetation and preferably does not contain the plague minnow (*Gambusia holbrooki*). Foraging habitat and dispersal habitat are areas of native and nonnative vegetation (DPIE 2020c). The construction envelope does not contain any waterbody with a substantial amount of emergent aquatic vegetation considered suitable for support this species. Very little emergent aquatic vegetation is found along the periphery of Lake Lyell. The reservoir contains a variety of predatory exotic fish such, as Rainbow Trout and Redfin Perch, and so is unlikely to be suitable as habitat. Although there is potential habitat for the species in well-vegetated farm dams on private property within 1 km of the construction envelope that could not be accessed for survey, if a 200 m buffer was applied from the top of the bank from these waterbodies, it would not intersect with the construction envelope. A 200 m buffer around aquatic habitat defines the species polygon for the species as described in the NSW Survey Guide for Threatened Frogs (DPIE 2020c). The construction envelope is outside of the species' known or predicted distribution; it is outside of the expert distribution 'maybe' area by about 70 km and 'likely' distribution areas by about 270 km (ALA 2025). The species is considered very unlikely to occur on in the construction envelope both on the basis that it should be considered vagrant in the locality (locally extinct) and that the waterbodies present are highly degraded.
Lophoictinia isura	Square-tailed Kite (Breeding)	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Nest trees.	-	Yes	Yes	Yes	Yes	-	No	Included in area containing habitat constraint. Species was included in surveys but has since been excluded from further assessment for species credits as no nest trees or other signs of breeding activity found within the construction envelope or a 100 m buffer surrounding the construction envelope. Large trees were absent within DNG and exotic grassland vegetation zones. Species excluded from DNG and exotic grasslands.

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					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Miniopterus orianae oceanensis	Large Bent-winged Bat (Breeding)	3211, 3347, 3348, 3369, 3650, 3687, 3385, 3735, 3747	• Caves - Cave, tunnel, mine, culvert or other structure known or suspected to be used for breeding including species records in BioNet with microhabitat code 'IC – in cave', observation type code 'E nest-roost',or with numbers of individuals >500. • Or from the scientific literature.	-	Yes	Yes	Yes	Yes	-	No	Excluded from entire project. Maternity caves (breeding habitats) have very specific temperature and humidity regimes (NSW DCCEW 2024, Dwyer and Hamilton-Smith 1965). Significant subterranean roost sites for bats typically have a combination of the following features: near-horizontal orientation, presence of standing water or at least a damp floor, a domed area where temperature and humidity are elevated, deep enough to have a fully dark area where temperatures are constant, restricted airflow (EPRD 2004). Breeding habitat, generating species credits includes associated PCTs within 100 m of breeding habitat features. No karst (eroded limestone landscape) features are found in or near the construction envelope. No quartz sandstone geology, containing cliffs and gorges, is found in or near the construction envelope. The predominantly metasedimentary (quartzite), fine-grained sedimentary (mudstone) and granite geology of the locality is not typically associated with substantial cave formation. There are no Bionet records with microhabitat code 'IC – in cave', observation type code 'E nest-roost', or with numbers of individuals >500 within 100 m of the construction envelope. The nearest records of the species are from more than 3 km from the construction envelope (ALA 2025). The only large outcroppings of rock are found in the vicinity of Mt Walker, located 50 to 100 m north of the construction envelope. These areas contain large crevices and small cavities but do not appear to contain any caves. Rocky areas in the Mt Walker area contain only very small cliffs, around 5 to 15 m high, without any areas suitable this species to congregate in large number or breed. These rocky areas do not have any of the features associated with significant subterranean roost sites for bats.
Mixophyes balbus	Stuttering Frog	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3735, 3747	-	Yes	-	Yes	Yes	Yes	-	-	Excluded from entire project. The species is found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range. Suitable breeding habitat consists of permanent or ephemerally flowing streams with permanent pools located within areas of listed suitable native vegetation (PCTs) (DPIE 2020c). There are no permanent or ephemerally flowing streams with permanent pools in associated IBRA subregions in or adjacent to construction envelope. The species is not associated with the Hill End IBRA subregion. There are no permanent or ephemerally flowing streams with permanent pools located anywhere in the construction envelope. The species is considered very unlikely to occur on in the construction envelope on the basis that the waterbodies present are unsuitable as habitat and/or highly degraded.
Myotis macropus	Southern Myotis	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Waterbodies with permanent pools / stretches 3 m or wider, including rivers, large creeks, billabongs, lagoons, estuaries, dams and other waterbodies, on or within 200 m of the site.	Yes. In part.	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Excluded from Sedge, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and only a very low diversity of disturbance-tolerant native ground layer plants; Southern Myotis may forage over Lake Lyell adjacent to these areas but the species is unlikely to utilise these zones they do not contain any waterbodies with permanent pools/stretches 3 m or wider nor any potential roosting habitat such as tree hollows, bridges, culverts or rock outcrops. These zones are unlikely to have any greater value to the species than cleared land and modification to these areas would have negligible impact on the species.
Ninox connivens	Barking Owl (Breeding)	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Hollow bearing trees -Living or dead trees with hollows greater than 20 cm diameter and greater than 4 m above the ground.	Yes. In part.	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Excluded from Poor, DNG, DNG_Poor and exotic grasslands (DEGH) zones due to their lack of hollow-bearing trees.

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					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Ninox strenua	Powerful Owl (Breeding)	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Hollow bearing trees - Living or dead trees with hollow greater than 20 cm diameter.	Yes. In part.	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Excluded from Poor, DNG, DNG_Poor and exotic grasslands (DEGH) zones due to their lack of hollow-bearing trees.
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Bursaria spinosa or within 40m of Bursaria spinosa. • Above 800 m altitude (geographic constraint).	Yes. In part.	Yes	Yes	Yes	Yes	-	Yes	Included in area containing habitat constraint. Included in areas which meet habitat and geographic constraints and contain patches of *Bursaria spinosa* plants. Excluded from DNG_Poor, Poor and exotic grasslands (DEGH) zones due to their lack of *Bursaria spinosa* feeding habitat for larvae, and low-density nectar-producing forbs and shrubs for butterflies.
Petauroides volans	Southern Greater Glider	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	-	Yes. In part.	Yes	Yes	Yes	Yes	-	-	Included in better condition areas. Species excluded from Poor, DNG and exotic grasslands zones due to their lack of mature trees.
Petaurus norfolcensis	Squirrel Glider	3211, 3347, 3369, 3650, 3687, 3735, 3747	-	Yes. In part.	Yes	Yes	Yes	Yes	-	-	Included in better condition areas. Species excluded from Poor, DNG and exotic grasslands zones due to their lack of mature trees.
Petrogale penicillata	Brush-tailed Rock-wallaby	3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747	• Land within 1 km of rocky escarpments, gorges, steep slopes, boulder piles, rock outcrops or clifflines	Yes. In part.	-	Yes	Yes	Yes	-	Yes	Excluded from entire project. The species is not associated with the Hill End IBRA subregion in which most of the site is located. It is associated with the Bathurst IBRA subregion however habitat in the construction envelope in this region consists of narrow degraded roadside strips of woodland and forest that do not contain any potential rocky shelter sites that could support this species.
Phascogale tapoatafa	Brush-tailed Phascogale	3211, 3347, 3348, 3367, 3650, 3735, 3747	-	-	Yes	Yes	-	-	-	-	Included in better condition areas. Species excluded from DNG_Poor and exotic grasslands zones due to their lack of trees.
Phascolarctos cinereus	Koala	3211, 3347, 3348, 3367, 3369, 3650, 3687, 3735, 3747	• Presence of koala use trees as defined in the "Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method Survey Guide for information on targeted survey requirements and mapping species polygons".	-	Yes	Yes	-	Yes	-	Yes	Included in better condition areas. Species excluded from DNG_Poor, Sedge and exotic grasslands zones due to their lack of trees.
Polytelis swainsonii	Superb Parrot	3367, 3369, 3735	• Living or dead E. *blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a Diameter at Breast Height (DBH) of greater than 30 cm.	-	Yes	Yes	-	-	Yes	Yes	Excluded as a candidate species from entire project. The construction envelope is well outside of the more inland distribution of this species, with only scattered records in the locality, some of which are likely to be attributable to escaped pets. It is only likely to occur as an occasional visitor in the locality. The species was not recorded during surveys and is unlikely to breed in the construction envelope. Species considered to be a vagrant in the region and not seen on site at all during surveys.

Step 1 – Identify threatened species for assessment		Step 2 – Assessment of habitat constraints									Step 3 – Identify candidate species for further assessment
Scientific name	**Common name**	**Associated PCTs in associated IBRA regions**	**Habitat and geographic constraints**	**Habitat degraded**	**Associated with PCT/s and IBRA subregion/s**				**Vagrant species**	**Constraint present in construction envelope?**	**Candidate species (included/excluded) and rationale**
					Hill End	**Bathurst**	**Burragorang**	**Wollemi**			
Pseudophryne australis	Red-crowned Toadlet	3687	-	Yes	-	-	Yes	-	-	-	Excluded from entire project. Excluded from PCT 3687 due to high soil disturbance (soil translocated and/or subject to substantial earthworks, low vegetation integrity scores (VI score <25) and the lack of potential shelter (rocks, logs and deep leaf litter) or streams in the zone.
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	3211, 3347, 3348, 3367, 3369, 3687, 3735, 3747	• Breeding camps.	-	Yes	Yes	Yes	Yes	-	No	Included in better condition areas. Species was included in surveys but has since been excluded from further assessment for species credits as no breeding camps were found within the construction envelope nor in adjacent areas.
Tympanocryptis mccartneyi	Bathurst Grassland Earless Dragon	3367, 3369	-	-	Yes	Yes	-	-	Yes	N/A	Excluded from entire project. According to the species' TBDC profile the Bathurst Grassland Earless Dragon is "restricted to the grasslands and open country on the alluvial plains around Bathurst in the Central Tablelands of NSW" and "the grasslands occur at altitudes up to approximately 1,200 m and are naturally treeless or sparsely treed, with native tussock grasses being the dominant vegetation (Melville et al. 2019 in the species' TBDC profile). The nearest record of the species is approximately 35 km from the construction envelope (ALA 2025). The area of associated PCTs in the construction envelope (PCTs 3367 and 3369) consists of moderately dense woodland to open forest and highly modified native and exotic grasslands containing scattered trees. There is no evidence to suggest that any area of the construction envelope contains any natural grassland or naturally very open woodland, based on the NSW State Vegetation Type Map (Pre-Clearing) (NSW DCCEEW 2022b). The construction envelope is more than 15 km outside of the modelled distribution (species or species habitat may occur) of the Bathurst Grassland Earless Dragon as shown in the species' EPBC Act conservation advice. The species distribution mapping 'may occur' category aims to capture the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species and was created using an extensive database of species observations records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research (TSSC 2023). The construction envelope does not contain any suitable habitat for the species and is outside of the modelled distribution (broad environmental envelope or geographic region that could provide habitat for the species). It is considered very unlikely to occur in the construction envelope and is therefore considered as a vagrant species for the purposes of this assessment and excluded from further consideration.
Tyto novaehollandiae	Masked Owl (Breeding)	3211, 3347, 3348, 3367, 3369, 3650, 3687, 3735, 3747	• Hollow bearing trees - Living or dead trees with hollows greater than 20 cm diameter.	Yes. In part.	Yes	Yes	Yes	Yes	-	Yes	Included in better condition areas. Species excluded from Poor, DNG, and exotic grasslands zones due to their lack of hollow-bearing trees.
Tyto tenebricosa	Sooty Owl (Breeding)	3211, 3650	• Hollow bearing trees - Living or dead trees with hollows greater than 20 cm diameter. • Caves or clifflines / ledges	-	-	-	-	-	-	• Yes- Hollow bearing trees • No - Caves or clifflines / ledges	Included in area containing habitat constraint. Not associated with Hill End or Bathurst IBRA subregions but recorded in the construction envelope in the Hill End or Bathurst IBRA subregions. Associated with the Burragorang and Wollemi IBRA subregions but not with the PCTs occurring in those regions within the construction envelope. Included in the Hill End IBRA subregion in associated PCTs and other PCTs in which the species was recorded.

6.3.2 Candidate species credit species requiring further assessment

Candidate species for further assessment were identified in accordance with Step 1 to 2 (section 5.2.1 to 5.2.2) of BAM (DPIE 2020a) and includes species that require assessment as listed in Table 1.2 of the SEARs. A list of species requiring further assessment is provided in Table 6.3.

Table 6.3 Candidate species credit species requiring further assessment

Scientific name	Common name	EPBC Act	BC Act	IBRA subregions and PCTs requiring survey (vegetation zones not excluded in Table 6.2).
Flora				
Acacia flocktoniae	Flockton Wattle	Vulnerable	Vulnerable	Bathurst PCT 3650
Acacia meiantha	-	Endangered	Endangered	Hill End PCT 3747
Asterolasia buxifolia	-	Endangered	Critically Endangered	Bathurst PCT 3348
Eucalyptus aggregata	Black Gum	Vulnerable	Vulnerable	Hill End, Bathurst and Burragorang PCTs 3347, and 3348 and 3385.
Eucalyptus cannonii	Capertee Stringybark	-	Vulnerable	Hill End PCTs 3369, 3735, 3747
Eucalyptus pulverulenta	Silver-leafed Gum	Vulnerable	Vulnerable	Hill End and Bathurst PCTs 3347, 3348, 3367, 3650
Eucalyptus robertsonii subsp. hemisphaerica	Robertson's Peppermint	Vulnerable	Vulnerable	Hill End and Bathurst PCTs 3735 and 3747
Leucochrysum albicans var. tricolor	Hoary Sunray	Endangered	Endangered	Hill End and Bathurst PCTs 3347, 3348, 3747
Persoonia marginata	Clandulla Geebung	Vulnerable	Vulnerable	Hill End and Bathurst PCTs 3369, 3735, 3747
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	Bathurst PCT 3348
Veronica blakelyi	-	-	Endangered	Hill End and Bathurst PCTs 3211, 3369, 3735
Fauna				
Aprasia parapulchella	Pink-tailed Legless Lizard	Vulnerable	Vulnerable	Hill End and Bathurst PCTs 3735, 3747
Burhinus grallarius	Bush Stone-curlew	-	Endangered	Hill End and Bathurst PCTs 3348, 3367, 3747

Scientific name	Common name	EPBC Act	BC Act	IBRA subregions and PCTs requiring survey (vegetation zones not excluded in Table 6.2).
Callocephalon fimbriatum	Gang-gang Cockatoo	Endangered	Endangered	Hill End and Bathurst Areas of the following PCTs where they contain eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger; 3211, 3348, 3367, 3369, 3650, 3735, 3747.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo (Breeding)	Vulnerable	Vulnerable	Hill End and Bathurst Areas of the following PCTs where they contain living or dead tree with hollows greater than 15cm diameter and higher than 8m above ground; 3211, 3348, 3367, 3369, 3650, 3735, 3747.
Cercartetus nanus	Eastern Pygmy-possum	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3369, 3650, 3735, 3747
Chalinolobus dwyeri	Large-eared Pied Bat	Endangered	Vulnerable	Hill End and Bathurst PCTs 3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747
Haliaeetus leucogaster	White-bellied Sea-Eagle (Breeding)	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3369, 3650, 3735, 3747
Hieraaetus morphnoides	Little Eagle (Breeding)	-	Vulnerable	Hill End and Bathurst PCTs 3348, 3367, 3369, 3650, 3735, 3747
Lophoictinia isura	Square-tailed Kite (Breeding)	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3369, 3650, 3735, 3747
Myotis macropus	Southern Myotis	-	Vulnerable	Hill End and Bathurst All PCTs within 200 m of Lake Lyell / Farmers Creek and farm dams.
Ninox connivens	Barking Owl (Breeding)	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3369, 3650, 3735, 3747
Ninox strenua	Powerful Owl (Breeding)	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3369, 3650, 3735, 3747
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	Vulnerable	Endangered	Hill End and Bathurst PCTs 3348, 3367, 3369, 3650, 3735, 3747

Scientific name	Common name	EPBC Act	BC Act	IBRA subregions and PCTs requiring survey (vegetation zones not excluded in Table 6.2).
Petauroides volans	Southern Greater Glider	Endangered	Endangered	Hill End and Bathurst PCTs 3348, 3367, 3369, 3650, 3735, 3747
Petaurus norfolcensis	Squirrel Glider	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3369, 3650, 3735, 3747
Phascogale tapoatafa	Brush-tailed Phascogale	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3650, 3735, 3747
Phascolarctos cinereus	Koala	Endangered	Endangered	Hill End and Bathurst 3211, 3348, 3367, 3369, 3650, 3735, 3747
Pteropus poliocephalus	Grey-headed Flying-fox (Breeding)	Vulnerable	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3369, 3735, 3747
Tyto novaehollandiae	Masked Owl (Breeding)	-	Vulnerable	Hill End and Bathurst PCTs 3211, 3348, 3367, 3369, 3650, 3735, 3747
Tyto tenebricosa	Sooty Owl (Breeding)	-	Vulnerable	Hill End PCTs 3211, 3650 which are associated with the species. PCTs 3369 and 3735 in which the species was also recorded.

6.3.3 Targeted species survey methods and effort

Targeted candidate species surveys were undertaken to determine whether candidate species occupy the construction envelope and to define the condition and the extent of habitat for candidate species present (i.e. the species polygons).

i Targeted flora surveys

Table 6.4 provides a summary of the threatened flora species surveys, including survey period for each candidate species. Targeted threatened flora surveys were carried out during appropriate detection periods in 2023 and 2024. Some species were targeted during multiple searches over several months.

Targeted threatened flora surveys were conducted in all vegetation zones identified as suitable habitat at Step 3. Some other vegetation zones were, however, surveyed opportunistically during these surveys.

The BAM guideline for surveying threatened plants and their habitats (DPIE 2020b) recognises that “the survey design described in this guide may be impractical for some large-scale projects where the time taken to search large areas of suitable habitat for small threatened species is high” and includes a two-phase grid-based systematic survey approach for large areas of suitable habitat (> 50 ha). The first phase of a two-phase grid-based survey involves searches of 40 m diameter areas at 100 m grid intersections. If a target species is located, a finer-scale grid survey is used (second phase). This is used to locate the population extent, which will help define the species polygon.

The finer-scale grid was used as per Table 4 DPIE (2020b) which is dependent on the habitat type, vegetation type and condition and landscape attributes surrounding the locations where the target species was detected.

Where the two-phase grid-based systematic survey was not used for suitable species habitat <50 ha, targeted flora surveys were undertaken in accordance with DPIE (2020b) and DoE (2013a) guidelines and included transects using spacing as defined in Table 1 of DPIE (2020b). Transect surveys were spaced at intervals of 10 m due to the open understorey of the vegetation communities surveyed, meeting the minimum survey effort requirements for all relevant candidate species. Each survey targeted fewer than five target species, all in the same vegetation stratum.

As some small areas of the hillside habitat in the construction envelope are very steep and covered in thickets of Blackberry, walking of closely spaced and parallel transects was not always safe or feasible. In such areas, transects were more meandering with their path dictated by safe access.

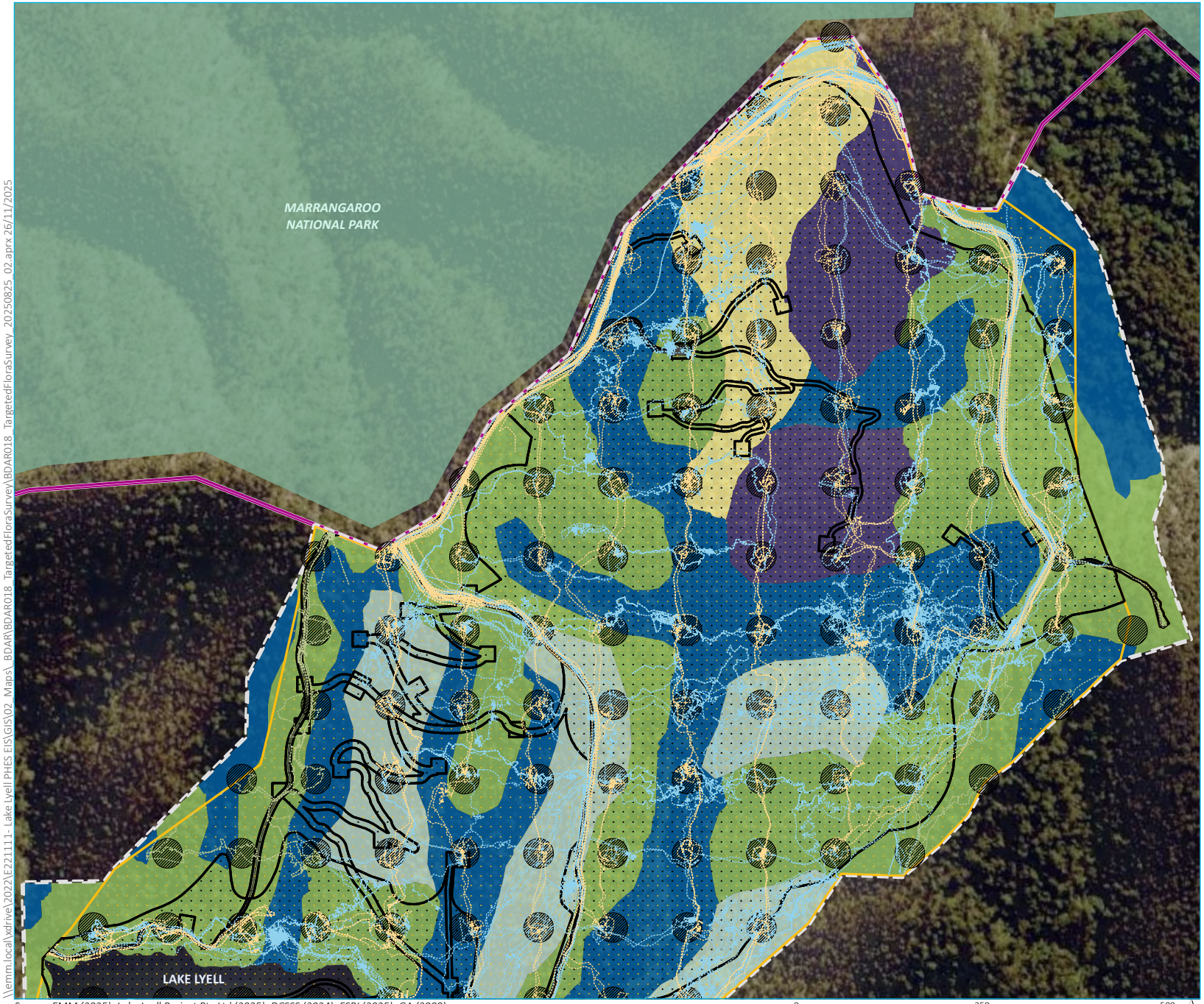
Targeted flora survey effort is indicated in Figure 6.1 and detailed in Table 6.4. The minimum survey effort is considered met for all targeted candidate flora species, except *Asterolasia buxifolia.* Further commentary regarding the context for this assessment is provided in Section 6.3.4.

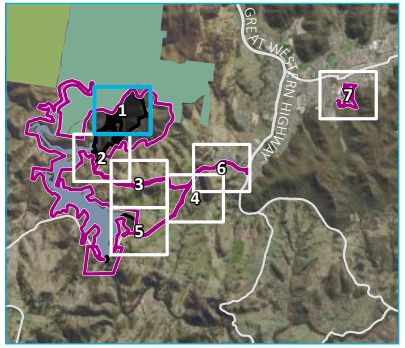
Incidental observations of threatened flora were also made during the mapping of vegetation and the survey of BAM plots, whereby most of the more heavily vegetated parts of the construction envelope and much of the derived native grassland and exotic grassland area were traversed on foot. In addition to targeted surveys, threatened flora species that are detectible year-round were searched for during this at approximately 20 m spacing during vegetation mapping, which included identification of plants, particularly trees and shrubs for the purposes of PCT identification. BAM plots also provided opportunities for detection of threatened species, particularly ground layer species.

Table 6.4 Targeted candidate flora species survey period

Scientific name	Common name	Recommended survey period	Survey method	Survey months
Acacia flocktoniae	Flockton Wattle	July to September	The small areas (0.05 ha) of suitable habitat in the associated IBRA subregion (PCT 3650) thoroughly surveyed during a linear (80 m x 10 m, 0.04 ha) floristic BAM plot survey.	January
Acacia meiantha	-	July to October	Transect surveys at 10 m spacing (PCT 3747).	October
Asterolasia buxifolia	-	September to November	Transect surveys at 10 m spacing (PCT 3348).	January, February
Eucalyptus aggregata	Black Gum	All year	Transect surveys at 10 m spacing (PCT 3348). PCT mapping surveys inspecting all trees (access roads and camp sites).	January, February

Scientific name	Common name	Recommended survey period	Survey method	Survey months
Eucalyptus cannonii	Capertee Stringybark	All year	Two-phase grid surveys. Transect surveys at 10 m spacing (access roads). PCT mapping surveys inspecting all trees (access roads and camp sites).	September, October, November, January
Eucalyptus pulverulenta	Silver-leafed Gum	All year	Two-phase grid surveys. Transect surveys at 10 m spacing (access road). PCT mapping surveys inspecting all trees (access roads and camp sites).	September, October, November, January, February
Eucalyptus robertsonii subsp. hemisphaerica	Robertson's Peppermint	All year	Two-phase grid surveys Transect surveys at 10 m spacing (access road). PCT mapping surveys inspecting all trees (access roads and camp sites).	September, October, November, January
Leucochrysum albicans var. tricolor	Hoary Sunray	January, February, March, April, September, October, November, and December.	Transect surveys at 10 m spacing (PCTs 3348 and 3747).	October, January, February
Persoonia marginata	Clandulla Geebung	January to March	Two-phase grid surveys. Transect surveys at 10 m spacing (PCT 3747). The small areas of suitable habitat in the Town camp site thoroughly inspected during PCT mapping and floristic BAM plot surveys.	January, February
Thesium australe	Austral Toadflax	January, February, November, and December	Transect surveys at 10 m spacing (PCT 3348).	January, February
Veronica blakelyi	-	January, February, and December	Two-phase grid surveys. Transect surveys at 10 m spacing (access road). The small areas of suitable habitat in the Town camp site thoroughly inspected during PCT mapping and floristic BAM plot surveys.	January, February





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Two-phase grid survey target area

Targeted flora survey

- Spring 2023
- Summer 2024
- Winter 2024
- Summer 2025
- Autumn 2025

Plant community type

- Unvegetated

PCT 3211 | Central Tableland Montane Wet Forest

- Moderate

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Moderate

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- High

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest

- High

Existing environment

- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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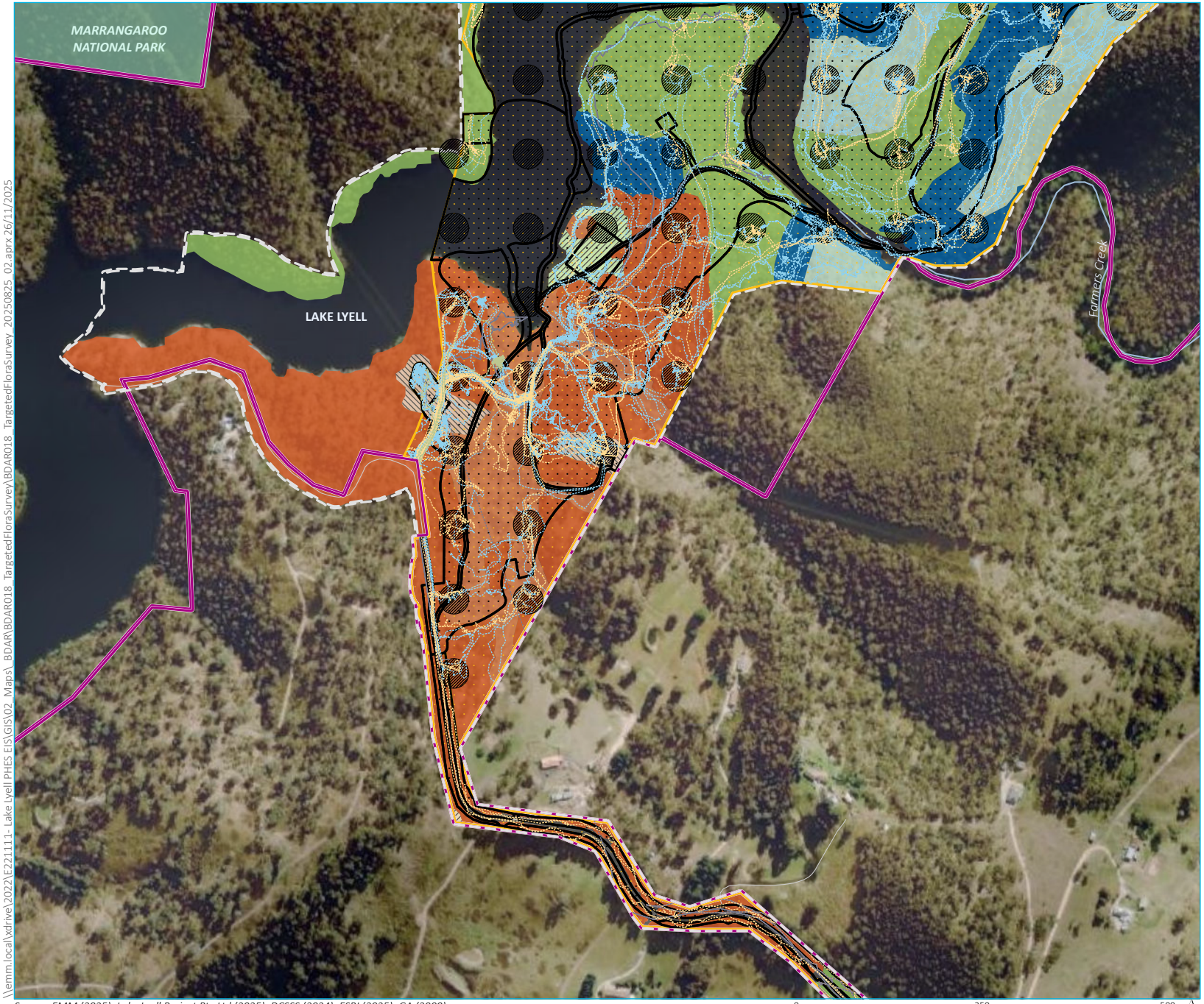
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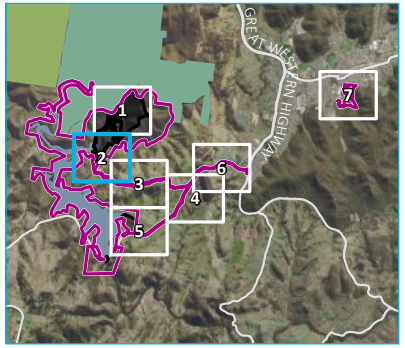
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Targeted flora surveys- Map 1 of 7

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Figure 6.1

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Two-phase grid survey target area

Targeted flora survey
- Spring 2023
- Summer 2024
- Winter 2024
- Summer 2025
- Autumn 2025

Plant community type
- Unvegetated

PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest
- Derived exotic grass or herbs

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland
- Moderate
- Poor
- Derived shrubland

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest
- Moderate

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest
- High

PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest
- High

Existing environment
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Targeted flora surveys- Map 2 of 7

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Figure 6.1

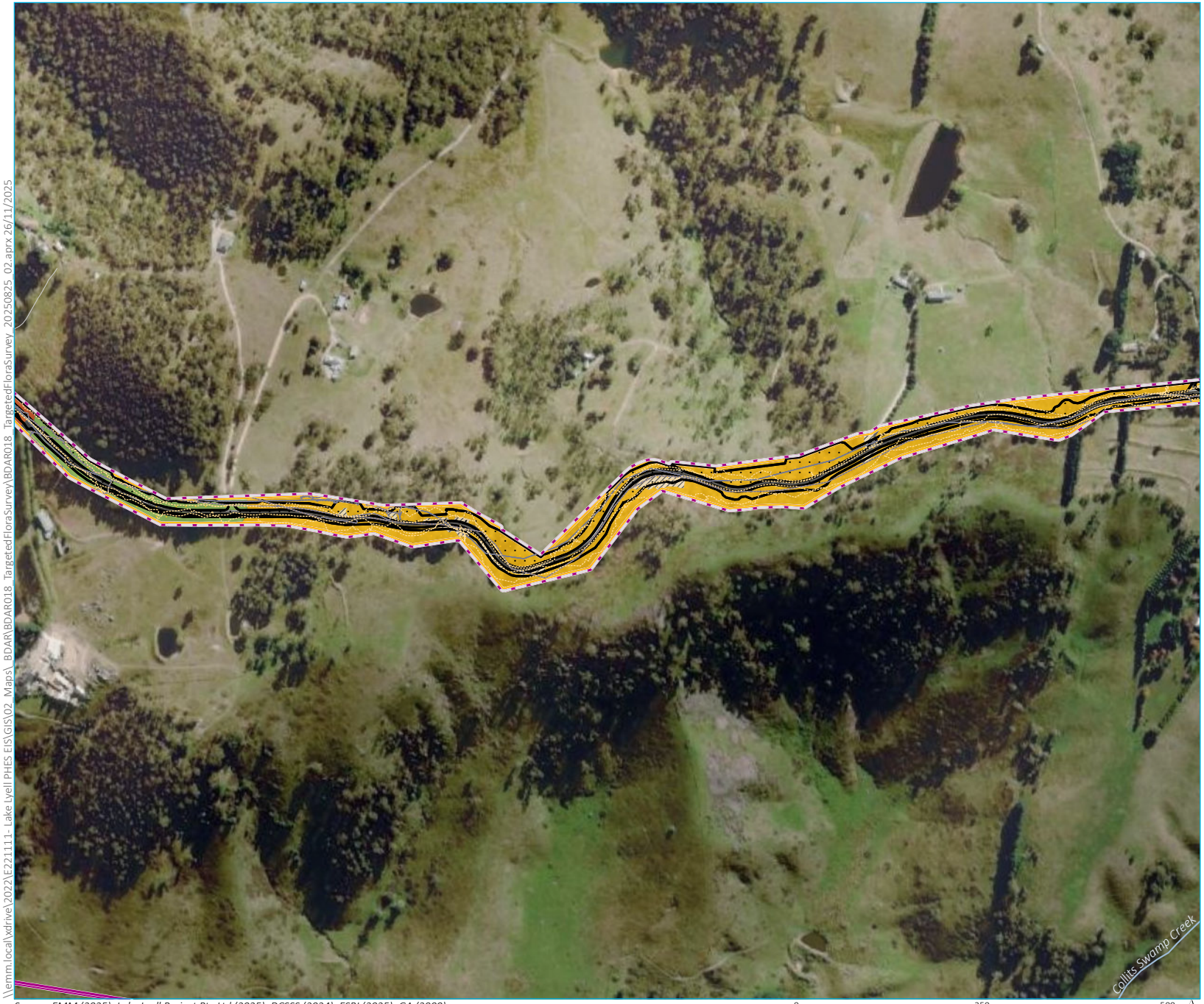
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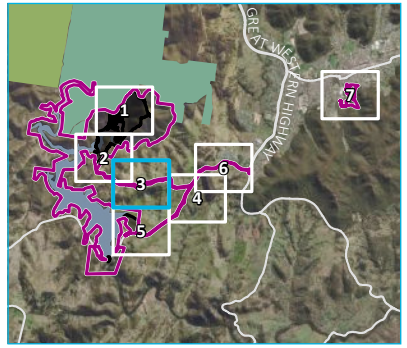
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creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Two-phase grid survey target area

Targeted flora survey

- Spring 2023
- Summer 2024
- Winter 2024
- Summer 2025
- Autumn 2025

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest

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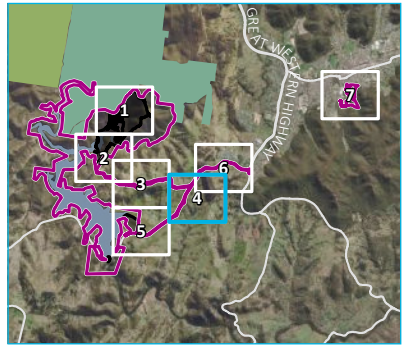
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Targeted flora surveys- Map 3 of 7

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Figure 6.1

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Two-phase grid survey target area

Targeted flora survey

- Spring 2023
- Summer 2024
- Winter 2024
- Summer 2025
- Autumn 2025

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs
- Exotic woody vegetation

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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Targeted flora surveys- Map 4 of 7

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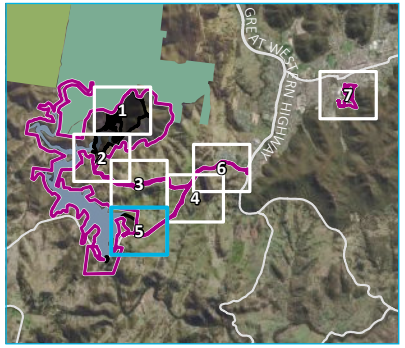
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Figure 6.1

EMM creating opportunities

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Two-phase grid survey target area

Targeted flora survey

- Spring 2023
- Summer 2024
- Winter 2024
- Summer 2025
- Autumn 2025

Plant community type

- Unvegetated

PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest

- Derived sedgeland

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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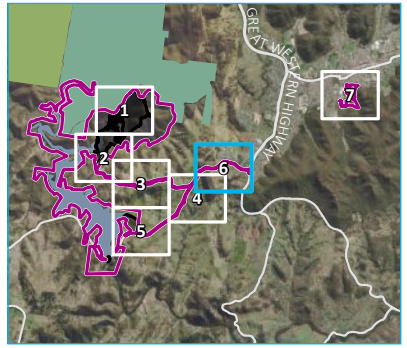
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Targeted flora surveys- Map 5 of 7

Lake Lyell PHES
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Figure 6.1

EMM
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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Two-phase grid survey target area

Targeted flora survey

- Spring 2023
- Summer 2024
- Winter 2024
- Summer 2025
- Autumn 2025

Plant community type

- Planted non-indigenous native plants
- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Exotic woody vegetation

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- Moderate

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

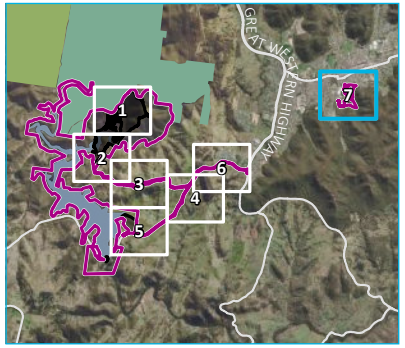
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Targeted flora surveys- Map 6 of 7

Lake Lyell PHES
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Figure 6.1

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Two-phase grid survey target area

Targeted flora survey

- Spring 2023
- Summer 2024
- Winter 2024
- Summer 2025
- Autumn 2025

Plant community type

- Unvegetated

PCT 3385 | Southern Tableland Creekflat Swamp Woodland

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3687 | Newnes Plateau Peppermint-Ash Tall Forest

- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment

- Major road
- Minor road
- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

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Targeted flora surveys- Map 7 of 7

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ii Targeted fauna surveys

Table 6.5 provides a summary of the threatened fauna species surveys, including survey period for each species. Targeted fauna surveys were conducted within the survey area in accordance with various NSW and Commonwealth guidelines, listed for the corresponding species groups below.

Survey methods and effort are outlined for each fauna group below. Fauna survey locations are illustrated in Figure 6.2 for birds and for other fauna in Figure 6.3 . A summary of fauna survey effort is provided below, while weather data for the survey period is provided in Appendix C.

Table 6.5 Targeted fauna survey method

Target species group	Target species	Survey methods employed	Recommended survey period	Survey timing
Birds	Bush Stone-curlew	Call playback, spotlighting, watching and listening surveys. Traversing habitat on foot.	All year	January, February, April, May, June, July, August, September, October, November, and December
	Superb Parrot	Area and transect searches, watching and listening surveys. Opportunistic observations.	September to November	October, November
	Gang-gang Cockatoo	Nest tree searches, area and transect searches, listening surveys, watching individuals and flocks when found. Opportunistic observations.	October to January	October, November, December to January
	South-eastern Glossy Black-Cockatoo (Breeding)	Area and transect searches, watching and listening surveys. Opportunistic observations.	January to September	January, February, April, May, June, July, August, September
	Little Eagle (Breeding)	Nest tree searches, area and transect searches, and vantage point surveys. Opportunistic observations.	August to October	August, September, October
	Square-tailed Kite (breeding)		September to January	September, October, December, January
	White-bellied Sea-Eagle (Breeding)		July to December	July, August, September, October, December
	Barking Owl (Breeding)	Targeted nest tree searches, spotlighting, stag watching, call playback, passive acoustic monitoring and listening surveys.	January to August	July and August
	Masked Owl (Breeding)		January to August	
	Powerful Owl (Breeding)		January to August	
	Sooty Owl (Breeding)		January to August	

Target species group	Target species	Survey methods employed	Recommended survey period	Survey timing
Mammals - marsupials	Eastern Pygmy-possum	Remote camera surveys. Spotlighting surveys.	October to March	January, February, March, November, December
	Southern Greater Glider	Spotlighting surveys.	All year	January, February, March, May, June, July, August, November, December
	Squirrel Glider	Remote camera surveys. Spotlighting surveys.	All year	January, February, March, May, June, July, August, November, December
	Brush-tailed Phascogale	Remote camera surveys. Spotlighting surveys.	December to June	January, February, March, May, June, December
	Koala	Koala detection dogs. Spotlighting surveys. Passive acoustic monitoring.	All year	Passive acoustic monitoring: June and July Koala detection dogs: February and March
Mammals - bats	Large-eared Pied Bat	Anabat detection, roost searches.	November to January	November, December, January
	Large Bent-winged Bat (Breeding)	Anabat detection, roost searches.	December to February	December, January
	Southern Myotis	Anabat detection.	October to March	November, December, January
	Grey headed Flying-fox (breeding)	Camp sites for flying foxes were searched for throughout the site on foot.	October to December	October, November, December
Reptiles	Pink-tailed Legless Lizard	Diurnal rock turning searches.	September to November	October and November
Insects	Purple Copper Butterfly (Bathurst Copper Butterfly)	Searching *Bursaria spinosa* bushes, in sunshine >15°C.	September, October, and December	September and October

a Diurnal birds

Diurnal bird surveys were undertaken for the following species:

- Gang-gang Cockatoo
- South-eastern Glossy Black-Cockatoo
- White-bellied Sea-eagle
- Little Eagle
- Square-tailed Kite

- Superb Parrot.

Bird survey methods and survey effort have been developed in accordance with:

- NSW DCCEEW threatened biodiversity profile data collection (TBDC) (BCS 2025b)
- *Survey guidelines for Australia's threatened birds* (DEWHA 2010)
- *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (working draft)* (DEC 2004).

Methods included a mix of area and vantage point surveys to record species presences, targeted nest searches, large hollow (stag) watching at sunset, and bird listening and watching surveys. Methods and survey effort are outlined in Table 6.6.

Table 6.6 Methods and survey effort – diurnal birds and nocturnal bird hollows

Method	Survey description	Survey effort
Area searches/vantage point surveys • Regent Honeyeater • Bush Stone-curlew • Swift Parrot, Superb Parrot • South-eastern Glossy Black-Cockatoo • Gang-gang Cockatoo • Little Eagle • White-bellied Sea-eagle • Square-tailed Kite	Area searches and vantage point surveys included: • land based area and vantage point searches • ecologists conducted area and vantage point surveys within the construction envelope • ecologists traversed across potential habitat during the breeding seasons of the target species, searching for large stick nests and soaring birds • all calls and habitat features were investigated • birds observed or heard were recorded.	DEC (2004) has not resolved bird survey requirements and does not provide guidance on survey effort, particularly for nesting birds. DSEWPaC (2010) was reviewed, and sympatric species survey efforts indicated 8 hours over four days (two hours per day) for sites less than 50 ha. No survey effort for larger sites is provided. Searches for raptor nests were carried out in all locations containing trees. Vantage point surveys took advantage of locations where large areas of the construction envelope could be viewed, with a focus on detecting soaring as raptors; Little Eagle, White-bellied Sea-eagle and Square-tailed Kite. This survey methodology was undertaken for all areas of the project, focusing on areas of suitable and known habitat (e.g. *Allocasuarina* stands and known and potential Gang-gang Cockatoo hollows), providing a large coverage of the survey area. 121, 30 minutes area searches were undertaken, by one or two ecologists, traversing suitable habitat, and watching and listening for target species, whilst recording hollow-bearing trees and searching for raptor nests, totalling approximately 60 hours and 30 minutes, over 34 days. Eight 20-to-30-minute targeted raptor surveys were undertaken, watching the sky and suitable habitat from vantage points, totalling approximately 3 hours and 40 minutes.

Method	Survey description	Survey effort
Targeted nest searches/hollow bearing tree surveys • South-eastern Glossy Black-Cockatoo • Gang-gang Cockatoo • Little Eagle • White-bellied Sea-eagle • Square-tailed Kite	Diurnal surveys included: • observers traversed across available habitat, seeking out habitat features including nest trees and hollows • suitable nest or breeding hollows (as defined for each species in the TBDC) were recorded, including the location, and hollow description. Suitable nests and hollows were observed for breeding activity.	NSW DCCEEW is currently developing survey guidance for nest searches. The TBDC outlines that active nest should be assessed for the presence of each target species. For South-eastern Glossy Black-Cockatoo and Gang-gang Cockatoo, the TBDC states that the surveyors should look for signs of breeding. Where signs of breeding are present, potential nest trees should be identified. Potential nest trees are to be monitored during the breeding season to confirm actual nest trees. 121, 30-minute area searches were undertaken, by one or two ecologists, traversing suitable habitat, and watching and listening for target species, whilst identifying hollow and nest habitat, and observing for breeding activity. These surveys totalled approximately 60 hours and 30 minutes, over 34 days. Field staff were instructed to watch and listen for these species while undertaking other daytime surveys (e.g. flora surveys) during the species' breeding seasons and to investigate any sightings to assess potential breeding behaviour as describe in the TBDC. Repeat visits were made to locations where signs of breeding activity (hollow-focused behaviour) were observed, in an attempt to confirm nesting of South-eastern Glossy Black-Cockatoo and Gang-gang Cockatoo.

b Nocturnal birds

Nocturnal bird surveys were undertaken for the following species:

- Bush Stone-curlew
- Barking Owl
- Powerful Owl
- Masked Owl
- Sooty Owl.

Bird survey methods and survey effort were development in accordance with the TBDC (BCS 2025b) and DEC (2004). Methods include call playback, spotlighting, potential nest hollow monitoring, and watching and listening surveys.

Table 6.7 Methods and survey effort – nocturnal birds

Method	Survey description	Survey effort
Call playback and spotlight • Barking Owl • Powerful Owl • Masked Owl • Sooty Owl	The TBDC provides the survey technique for call playback and spotlighting to target the Barking Owl, Powerful Owl, Masked Owl, and Sooty Owl. Surveys were conducted at night (around dusk) during calm and dry weather. The survey technique utilised from the TBDC is summarised below: 1. Allow 10 minutes listening and observation time prior to broadcasting. If the target owl(s) is observed or call is heard during this period, call playback is not required. 2. When the area of suitable habitat is 100 ha or less locate the call playback station as centrally as possible within suitable habitat (as per the TBDC). 3. Broadcast pre-recorded calls (e.g. single male, single female, duet and for masked owl, screech and chatter) for no more than 15 seconds followed by at least 30 seconds of listening time. Listen for the response or appearance of the target owl(s) during the listening time. Watch/listen for an owl that may be circling overhead. 4. At each station repeat the broadcast and listening sequence for 15 minutes for each target owl, unless the target owl is detected before 15 minutes expires. Increase the volume from 20% of natural volume up to 200% of natural volume with each repeated broadcast. 5. Search for owls drawn in by the broadcast within a 1-hectare circular plot around each broadcast station (radius approximately 57 m) at the end of the 15-minute repeated broadcast and listening sequence. Look and listen for the target species using a spotlight for 15 minutes, unless the target owl is detected before 15 minutes expires. Watch/listen for an owl that may be circling overhead. 6. Record the direction of fly in and time to respond to playback of detected owls, to reduce multiple counts of the same owl at different sample stations. 7. If simultaneously surveying for multiple owl species (e.g. Masked Owl, Sooty Owl, Powerful Owl and Barking Owl), the playback sequence may include an escalating sequence of calls of these species punctuated with listening periods between each species' call. The Masked Owl calls should come at the end of the sequence so that if birds respond with a single shriek the response is not obscured by further playback (DSE,2011).	Given the area of suitable habitat within the construction envelope being approximately 105 ha, call playback stations were spread across the site in 14 places, and surveyed over 17 nights, over a period of 11 months as follows: • two call playback sites were repeated 6 times • one location was repeated four times • two locations were repeated three times • two locations were repeated two times • seven locations were surveyed once. Following each call playback sequence, spotlighting on foot listening, and watching was undertaken within a 1-ha circular plot around each broadcast station, for 15 minutes or more. In order to minimise disturbance to owl behaviour calls were not repeated for species already detected on a site during a prior survey. The minimum survey effort was exceeded.

Method	Survey description	Survey effort
	8. Repeatedly sample at each survey station with up to 15 minutes of broadcast calls and listening sequences (as above), until an owl responds, or for at least six nights.	
Breeding habitat assessment (owls)	Assessment of vegetation zones in the construction envelope for their suitability as owl breeding habitat based on the presence of suitable tree hollows.	Surveys included: • hollow bearing tree surveys were undertaken across all areas of the site containing trees, recording attributes required for the assessment of owl breeding hollow suitability as defined in the TBDC for each species.
Call playback, spotlighting and flushing (Bush Stone-curlew)	DEC (2004) recommends a number of survey methods for the Bush-stone Curlew, including: • call playback: 2 to 4 km apart and conducted during the breeding season • spotlighting: by foot or from a vehicle driven in first gear • walking through habitat to flush Bush Stone-curlew. DEC (2004) recommends call playback and spotlighting are undertaken to target the Bush Stone-curlew: • surveys were commenced with a 15-minute listening period. Calls were played for 30 seconds, followed by 5 minutes of listening. This was followed by spotlighting on foot for 15 minutes or more.	Based on the above, and availability of suitable habitat, 11 call playback sites were surveyed over one to two nights per location. Following each call playback sequence, spotlighting on foot, listening, and watching was undertaken within a 1-ha circular plot around each broadcast station, for 15 minutes or more. The minimum survey effort was exceeded.
Spotlighting and listening surveys (All species)	Spotlight surveys were undertaken using handheld LED spotlights as per DEC (2004), and included: • transects of variable length but typically between 0.5 km and 2 km, undertaken by two observers • observers moved at a speed of less than 1 km per hour (i.e. one hour per 1 km of transect) scanning understorey vegetation and trees for animals using spotlights • all animals observed were positively where possible.	Spotlighting transect surveys were conducted on 35 occasions across the construction envelope, by pairs of two ecologists, across 18 nights, totalling approximately 70 spotlighting survey hours and 59 km of transect length. The minimum survey effort was exceeded.
Targeted nest searches and stag watching • Barking Owl • Powerful Owl • Masked Owl • Sooty Owl	The TBDC previously outlined that active nest should be assessed for the presence of each target species. This was a requirement whilst surveys were taking place, however, stag watching potential forest owl nests is no longer required. Previously, the TBDC stated that surveyors should look for signs of breeding forest owls and identify actual nest trees. These are no longer requirements under the BAM. DEC (2004) suggests stag watching potential roost hollows (for 30 minutes prior to sunset and 60 minutes after sunset).	A total of 24 stag watches of potential owl roosting hollows were undertaken, 30 minutes prior to sunset and up to 60 minutes after sunset.

Method	Survey description	Survey effort
Listening point surveys • Barking Owl • Powerful Owl • Masked Owl • Sooty Owl	Nocturnal surveys included: • observers undertake listening surveys for forest owls to determine presence and indications of breeding activity • when forest owls are heard observers, watched and/or followed owls.	Spotlighting transect surveys were conducted on 35 occasions across the construction envelope, in pairs of two ecologists, listening and observing for forest owls. These surveys were conducted across 18 nights, totalling approximately 70 spotlighting survey hours. At each of the 11 call playback sites, 10 minutes of listening and spotlighting was undertaken, prior to call playback. Owl calls were listened for, during the periodic call-playback over 15 minutes, then owls were spotlighted and listened for another 15 minutes. Call-playback surveys totalled approximately seven hours and 20 minutes of listening for owl species.

c Arboreal mammals

Targeted arboreal mammal surveys were undertaken for the following species:

- Eastern Pygmy-possum
- Southern Greater Glider
- Squirrel Glider
- Brush-tailed Phascogale
- Koala.

Methods and survey effort have been developed in accordance with OEH (2018b), DEC (2004), DSEWPaC (2011b) and DPE (DPE 2022) and survey effort is outlined in Table 6.8.

Table 6.8 Methods and survey effort – arboreal mammals

Method	Survey description	Survey effort
Spotlighting (All species)	DSEWPaC (2011a) recommends at least two 200 m transects per 5 ha site (or longer transects for larger sites). DEC (2004) recommends two transects per 200 ha of each stratification unit, repeated across two nights. Vegetation formations were the most appropriate stratification units and included Wet Sclerophyll Forests, Grassy Woodlands and Dry Sclerophyll Forests. Based on the three stratification units, this would equate to six 1 km spotlighting surveys, repeated on two occasions, requiring a total of 12 km in transect length. Spotlight surveys were undertaken using handheld LED spotlights as per DEC (2004), and included: • transects of variable length but typically between 0.5 km and 2 km, undertaken by two observers • observers moved at a speed of less than 1 km per hour (i.e. one hour per 1 km of transect) scanning understorey vegetation and trees for animals using spotlights. All animals observed were positively where possible.	Spotlighting transect surveys were conducted on 35 occasions across the construction envelope, by pairs of two ecologists, across 18 nights, totalling approximately 70 spotlighting survey hours and 59 km of transect length. The minimum survey effort was exceeded.
Camera trapping • Eastern Pygmy-possum • Squirrel Glider • Brush-tailed Phascogale	The TBDC provides guidance on camera trapping for Brush-tailed Phascogale, however, not for Eastern Pygmy-possum or Squirrel Glider. Therefore, these guidelines were adopted for arboreal mammal species. Remote camera surveys were undertaken in accordance with the following method: • Cameras were placed at least 20 m, or over 100 m apart. • Cameras were attached to tree and positioned approximately 1.5 m or higher above ground, with bait stations placed 1.5 m away. • Cameras were baited with standard bait-balls, in a bait canister with small holes and capped at either end, to limit bait theft by other species. Honey was dripped liberally on the bait tubes and trees, in front of the cameras. • The majority of cameras were deployed for a minimum of four weeks and rebaited after approximately two weeks. • A minority of cameras were deployed for two to over three weeks. • Cameras were evenly spaced across the project area.	A total of 108 cameras were deployed, totalling 4,295 camera trap nights. Four camera traps were deployed with a hair tube trap, with a bait canister. • 82 cameras remained in place for a minimum of four weeks and were rebaited after approximately two weeks • 26 cameras remained in place for a minimum of two weeks. For Brush-tailed Phascogale, the TBDC recommends "*A minimum of 4 cameras, independent of the size of the subject land, must be used for sites up to 1 ha, then an additional 2 cameras for every ha of suitable habitat thereafter*". For sites >10 ha, it is recommended that the BOS Helpdesk is contacted to provide a camera survey approach for review by a species expert. BCS was contacted regarding survey effort for the species and requested that a survey plan be provided. As the surveys had already commenced at the time and the study area for the surveys was not yet defined, providing a survey plan was not practical. Given the extensive camera trapping survey of 4,295 camera trap nights across the project area, the camera trapping survey effort is considered sufficient.

Method	Survey description	Survey effort
Koala Detection Dog Survey	Koala detection dog surveys were undertaken in accordance with the detection dog guidelines in '*Koala (Phascolarctos cinereus) Biodiversity Assessment Method Survey Guide*' (DPE 2022b). DPE (DPIE 2019) requires three 200 m transects for every 5 ha of suitable habitat, spaced approximately 100 m apart. To cover suitable habitat within the disturbance footprint (approximately 105 ha) required the equivalent of 70, 200 m transects. This equates to 14 km of transects covered by Koala detection dog surveys. Transects were located evenly throughout suitable habitat, ensuring representative coverage of PCTs. Detection dogs surveyed for scat along the transects. The detection dog handler walks the central transect twice, first in one direction and then the opposite. The detection dog was permitted to roam freely within the 25 m to the side of the transect. Tracking collars were also used to record tracks of the detection dogs and their handlers. Scat locations were recorded with a GPS. Opportunistic observations were also carried out when dogs were not actively searching.	Koala dog surveys were undertaken in six broad areas of the project area, including two sections of Sir Thomas Mitchell Drive, by one Koala detection dog with two Koala dog handlers, across 3 days. A total of 33.4 km of the project area was surveyed, as calculated by the total length of the GPS survey track of the Koala detection dog. The minimum survey effort required was exceeded.

d Bats

Surveys were undertaken for the following species:

- Large-eared Pied Bat
- Grey-headed Flying-fox.

Methods and survey effort have been developed in accordance with '*Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method*' DPIE 2021). Methods and survey effort are outlined in Table 6.9.

Table 6.9 Methods and survey effort –bats

Method	Survey description	Survey effort
Breeding habitat identification • Large-eared Pied Bat • Southern Myotis	Searches were undertaken on foot to locate any potential roost sites (caves, scarps, cliffs, rock overhangs, tunnels, culverts, bridges) across the disturbance footprint. Searches included searching for signs of microbats (urine stains, droppings, remains, and bat fly casings) during the daytime.	OEH (2018b) requires a 30-minute search per roost. Searches for potential roosts were undertaken across the entire disturbance footprint during hollow-bearing tree surveys and vegetation mapping surveys. Searches were also undertaken in the only two steep, rocky areas within 100 m of the construction envelope. No potential roost sites were identified within the disturbance footprint construction envelope. The one area of marginal potential habitat found within 100 m of the construction envelope was searched over approximately one person-hour.

Method	Survey description	Survey effort
Acoustic detection • Large-eared Pied Bat • Southern Myotis	Acoustic surveys were undertaken as follows: • Ultrasonic bat call detectors were set out near waterways, the edges of clearings and in flyways likely to be utilised by bats. • Detectors were placed out for a minimum of four nights, with devices set to record between dusk and dawn. Calls were analysed by a person experienced in bat call analysis. The survey guide for *'Species credit' threatened bats and their habitats* (DPIE 2021) guidelines specify a minimum survey effort of four sites surveyed for four nights (16 detector nights) per: • 50 ha of habitat for Large-eared Pied Bat • 2.5 km of riparian length of potential habitat, with the microphone directed over pools of water along creeks or rivers or other waterbodies for Southern Myotis. Approximately 2.3 km of riparian length of Lake Lyell (both sides of the reservoir) is located within the construction envelope, requiring 16 detector nights. It is estimated that approximately 105 ha of suitable habitat for Large-eared Pied Bat is present within the construction envelope, necessitating 32 nights of bat detector deployment (105 ha / 50 ha) x 16 = 34 detector nights required).	When the initial microbat surveys were planned and undertaken, the Southern Myotis was not associated with the Hill End IBRA subregion and so was not considered to be a candidate species for the project. It was subsequently added as a predicted species for the Hill End Subregion and therefore required additional assessment. Additional surveys were undertaken in 2025, which confirmed that this species occurs in the construction envelope. A total of 13 detectors were deployed for a cumulative total of 67 detector nights. The minimum survey effort was met for Large-eared Pied Bat. Potential habitat for Southern Myotis consists of associated PCTs within 200 m of suitable water bodies. Six bat detectors were placed immediately adjacent to the reservoir for a total of 30 detector nights. The minimum survey effort required was exceeded.
Grey-headed Flying-fox camp survey	Camp sites for flying foxes were searched for throughout the site on foot. If a camp is located the survey only needs to take place in the camp (i.e. the area occupied by the species) to identify breeding females.	The entire construction envelope was covered on foot during other flora and fauna surveys. 121, 30 minutes area searches were undertaken, by one or two ecologists, traversing suitable habitat, watching and listening for target species, whilst observing for potential Flying-fox camps, and hollow and nest habitat for other target species, totalling approximately 60 hours and 30 minutes, over 34 days.

e Reptile

Reptile surveys were undertaken for the following species:

- Pink-tailed Legless Lizard.

Methods and survey effort have been developed in accordance with DPE (2022c) and is outlined in Table 6.10.

Note that targeted surveys for Pink-tailed Legless Lizard were undertaken prior to an update to the TDBC, which recommends an Expert Report be prepared for this species. According to the BAM Operational guidelines Manual 1 (2020), "*If the department publishes new or revised survey guides, assessors are expected to apply them to all assessments for which the survey component is yet to be completed, and to all new assessments that commence on or after the publication date. This is to ensure that BARs meet the requirements of BAM Section 5.3(2.b). Where survey has been completed prior to the publication of a new or revised survey guide, the department expects the assessor (or surveyor) to have applied current best-practice in searching for the target species (in accordance with BAM Section 5.3(2.c).*" Given the approach to target surveys applied to Pink-tailed Legless Lizard followed the requirements in the BAM Reptile survey guideline (current prior to the TDBC update), it is considered the methodology used in the targeted surveys for Pink-tailed Legless Lizard are acceptable and in accordance with BAM 2020.

Table 6.10 Methods and survey effort - Reptiles

Method	Survey description	Survey effort
Diurnal rock turning searches (Pink-tailed Legless Lizard)	Diurnal rock turning searches were undertaken in accordance with the *Threatened reptiles Biodiversity Assessment Method survey guide* (DPE 2022c). Diurnal rock turning searches are required in each 50 ha of suitable habitat, from September to November, turning ≥2,000 suitable rocks, replicating the survey four times (DPE 2022c). Surveys comprised of turning over suitably sized rocks in areas of suitable habitat. When turning rocks, rocks were carefully re-placed to maintain the seal between rock and ground as failure to do this would be highly detrimental to species dwelling under rock surfaces. Surveys requiring turning over a minimum of 200 suitably sized rocks for every 5 ha of suitable habitat (Jones 1999; Osborne et al. 1991). Suitably sized rocks are approximately: • 300 mm wide and 50 mm deep (Wong et al. 2011) • 100 to 150 mm wide, 120 to 220 mm long, 50 to 150 mm deep (Jones 1999). Surveys were undertaken in the two hours after sunrise and two hours before sunset on sunny days (<50% cloud cover). This ensured a suitable thermal environment was present for the species to be sheltering under rocks at the time of survey. Surveys ceased once temperatures exceeded 25°C, as the species will move deeper underground where it is not detectable (Osborne et al. 1991; Jones 1999).	The construction envelope contains approximately 46 ha of associated PCTs. According to the TBDC, potential habitat includes "rocky areas or within 50m of rocky areas" Review of survey deadlines and literature did not reveal any particular density of surface rock required to support the species and hence all areas of associated PCTs would be considered suitable habitat. This would require the equivalent of 1,840 rocks being searched on four occasions (7360 rock turns in total). Diurnal rock turning searches were undertaken on 13 occasions, by one to four ecologists, turning rocks in suitable rocky habitat, on sunny days two hours after sunrise and two hours before sunset on sunny days, with temperature below 25°C. Surveys were undertaken in the associated PCTs and some areas of other PCTs that appeared to have characteristics more likely to suit the species. A total of 3,085 rocks were turned, while searching for the Pink-tailed Legless Lizard during the species survey season. This equates to approximately 40% of the survey effort required. Due to the small windows of suitable survey timing as defined in the species' survey guideline (DPE 2022c), changes to the construction envelope and weather constraints, the minimum survey requirement for the species was not met. See Section 6.3.4 for further context regarding the implications for this assessment.

f Insect

Insect surveys were undertaken for the following species:

- Purple Copper Butterfly (Bathurst Copper Butterfly).

Methods and survey effort have been developed in accordance with DPE (2022c) and is outlined in Table 6.11.

Table 6.11 Methods and survey effort - Insects

Method	Survey description	Survey effort
Searching *Bursaria spinosa* bushes for individuals and larvae	According the TBDC: • to survey adults requires full sunshine and temperature above 15 degrees, individual adults live for approximately two weeks however a site can be active for much longer as adults emerge • larvae are detectable at night in December when they are in the later stages of development and escorted by many attendant ants. Larvae are also present in Nov, but very small and difficult to detect. Project-specific consultation regarding the species was conducted with BCS as summarised in Section 1.3 and included in Attachment B. BCS recommended that reference sites should be monitored during the expected flying period and used to guide survey timing at the target site (aspect, elevation and seasonal variability can influence survey period). Advice from BCS stated that surveys should be repeated three times, at least two weeks apart, if species is not detected in one of the preceding surveys. But the advice did not include quantitative guidance in terms of effort per survey. Strict weather conditions were also described by BCS as necessary, including: • warm to hot day (above 15 degrees Celsius by 10:00 am). Survey should be undertaken during the warmest part the day (between 10:00 am to 2:00 pm) • clear or mostly cloudless sky (pause surveys if sun becomes obscured by cloud) • calm to low wind (an average of ≤1 to 10 km/h over a 10-minute period. This equates to Beaufort-values of Windforce that are ≤2 (light breeze). BCS also stated that they no longer recommend larvae surveys as they are unaware of any resources to assist with larvae identification, the surveys are quite specialised, and they require greater effort, and there appears to be lower detectability for site presence, than there is for adults.	A local reference site was checked for Purple Copper Butterfly during each survey period and the species was recorded at the reference population on the following dates: • 20/09/2023 • 03/10/2023 • 18/10/2023. All patches of potential habitat were surveyed at least once by a team of between two and four observers over the following periods: • 18/09/2023 – 22/09/2023 • 03/10/2023 – 06/10/2023 • 18/10/2023 – 20/10/2023. The time spent in each area was proportional to the amount of Bursaria present and the suitability of the habitat in terms of sunlight penetration. Larger patches in more open areas were surveyed two to three times with at least 30 minutes spent at each site however these surveys were not all separated by at least two weeks. No larval surveys were undertaken in accordance with guidance from CPHR. The minimum survey effort required was not met. See Section 6.3.4 for further context regarding the implications for this assessment.

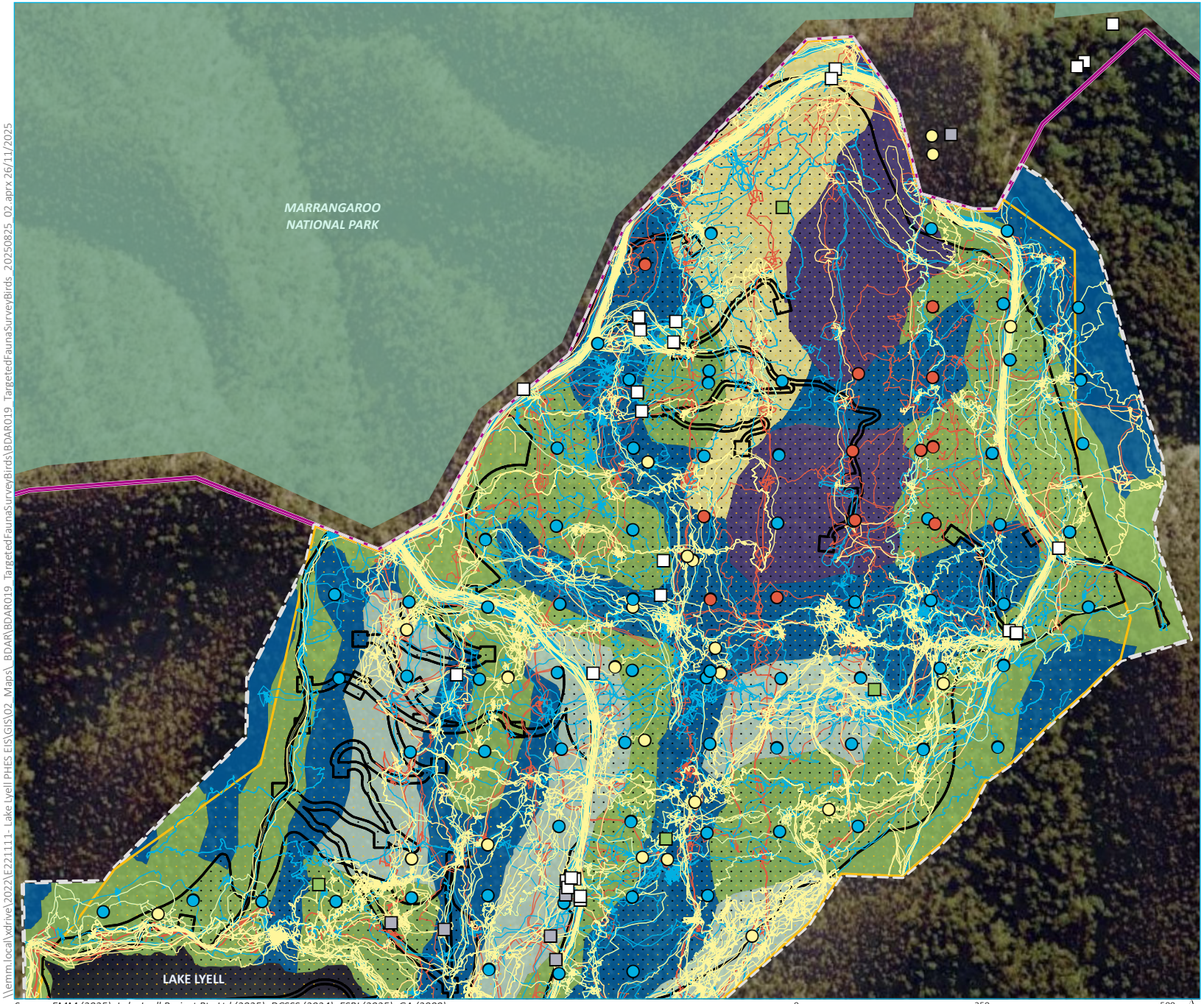
6.3.4 Survey gaps, assumed presences and effort summary

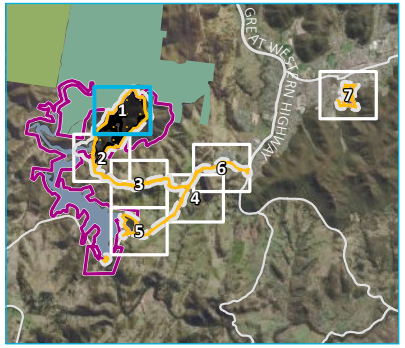
A summary of survey gaps and assumed presence along with comment where the survey effort did not meet guideline requirements is in Table 6.12.

Table 6.12 Survey summary of gaps and effort

Scientific name	Common name	Survey gaps	Assumed presence	Comment on gaps
Plants				
Asterolasia buxifolia	-	Habitat surveyed outside of recommended survey season due to late addition as candidate species.	No	The site is outside of the species' known distribution and outside of species' PMST modelled distribution. The species is known from a single location, where it is restricted to the riparian vegetation of the River Lett, near Hartley. The associated habitat for the species in the construction envelope (as defined by the combination of an associated PCT and the IBRA subregion) does not contain any riparian vegetation. This species was not recorded during targeted surveys despite being a relatively large and distinctive looking plant. No other Asterolasia species, or other similar plants, were observed. Additional surveys in PCT 3348 along the access road will be undertaken if required.
Reptiles				
Aprasia parapulchella	Pink-tailed Legless Lizard	Due to the small windows of suitable survey timing as defined in the species' survey guideline (DPE 2022c), changes to the construction envelope and weather constraints, the minimum survey requirements for the species were not met.	No	Based on analysis of the known distribution and habitat of the species (see Table 6.2), in summary, it is concluded that: • the construction envelope is outside of the species' known distribution - the nearest recorded location of the species is more than 40 km north-west of the construction envelope (ALA 2025) • habitat present is marginal based on the relatively high canopy cover as opposed to the grassland or open grassy woodland structure associated with the species. The species is considered unlikely to occur in the construction envelope and was not recorded during the surveys undertaken. A species expert report will be commissioned, if considered necessary to confirm the absence of the species.

Scientific name	Common name	Survey gaps	Assumed presence	Comment on gaps
Insect				
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	Due to the small windows of suitable survey timing as defined in the TBDC and based on advice from BCS, changes to the construction envelope and weather constraints, the minimum survey requirement for the species was not met.	Yes	Potential habitat was recorded in the construction envelope, however, due to a lack of recent fire or other forms of disturbance, this habitat is likely to be marginal for the species at present, with the population of the species on the site (if present) small and difficult to detect. The species was not recorded in the construction envelope during surveys but was recorded in a regularly slashed powerline easement approximately 300 m from the construction envelope in Marrangaroo National Park. The species has been assumed to occur in areas containing the host plant (i.e. *Bursaria spinosa*) above 850 m in altitude, as this higher elevation habitat aligns with the higher elevation habitats where this species has been typically recorded. Further discussion regarding the application of the advice regarding survey approach for Purple Copper Butterfly from CPHR is provided in Section 1.3.





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)

Targeted fauna survey

- Call playback survey
- Raptor targeted survey
- Passive acoustic survey

Cockatoo area search

- Gang-gang Cockatoo and Glossy Black Cockatoo
- Glossy Black Cockatoo
- Gang-gang Cockatoo

Survey tracks during breeding seasons

- Glossy Black-Cockatoo and Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Gang-gang Cockatoo

Plant community type

- Unvegetated

PCT 3211 | Central Tableland Montane Wet Forest

- Moderate

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Moderate

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- High

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest

- High

Existing environment

- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

N

Targeted fauna surveys- Birds

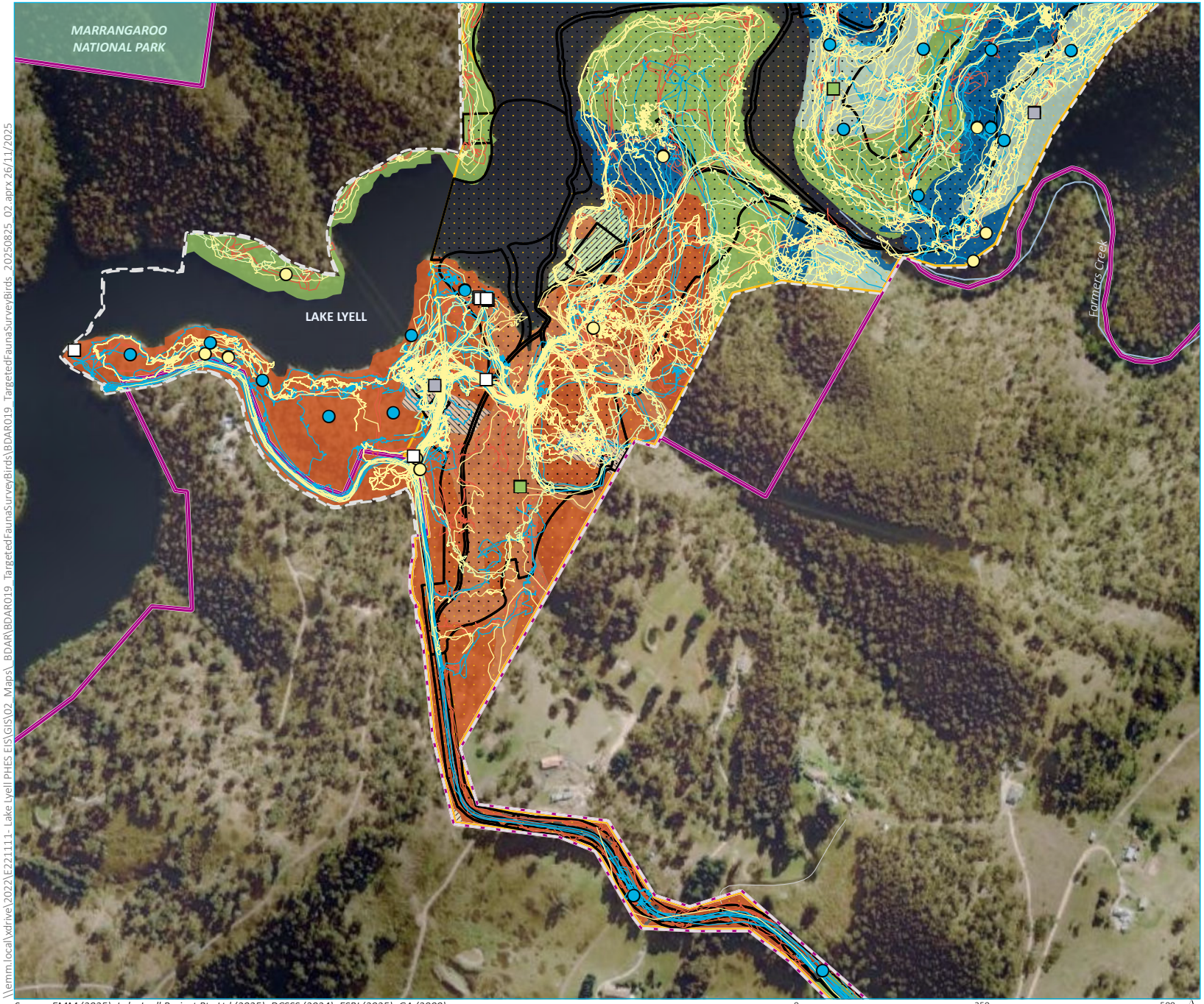
Map 1 of 7

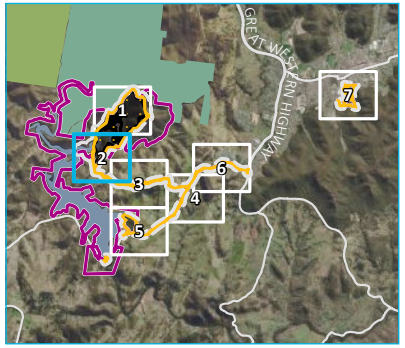
Lake Lyell PHES

Biodiversity Development Assessment Report

Figure 6.2

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)

Targeted fauna survey

- Call playback survey
- Raptor targeted survey
- Passive acoustic survey

Cockatoo area search

- Gang-gang Cockatoo and Glossy Black Cockatoo
- Glossy Black Cockatoo
- Gang-gang Cockatoo

Survey tracks during breeding seasons

- Glossy Black-Cockatoo and Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Gang-gang Cockatoo

Plant community type

- Unvegetated

PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest

- Derived exotic grass or herbs

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate
- Poor
- Derived shrubland

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Moderate

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest

- High

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest

Targeted fauna surveys- Birds

Map 2 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.2

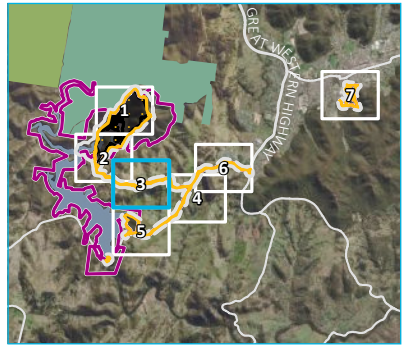
Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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creating opportunities

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)

Targeted fauna survey

- Call playback survey
- Raptor targeted survey
- Passive acoustic survey

Cockatoo area search

- Gang-gang Cockatoo and Glossy Black Cockatoo
- Glossy Black Cockatoo
- Gang-gang Cockatoo

Survey tracks during breeding seasons

- Glossy Black-Cockatoo and Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Gang-gang Cockatoo

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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Targeted fauna surveys- Birds

Map 3 of 7

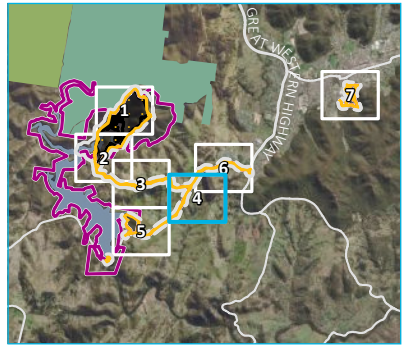
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Biodiversity Development Assessment Report

Figure 6.2

EMM creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)

Targeted fauna survey

- Call playback survey
- Raptor targeted survey
- Passive acoustic survey

Cockatoo area search

- Gang-gang Cockatoo and Glossy Black Cockatoo
- Glossy Black Cockatoo
- Gang-gang Cockatoo

Survey tracks during breeding seasons

- Glossy Black-Cockatoo and Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Gang-gang Cockatoo

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs
- Exotic woody vegetation

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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GDA2020 MGA Zone 56

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Targeted fauna surveys- Birds

Map 4 of 7

Lake Lyell PHES

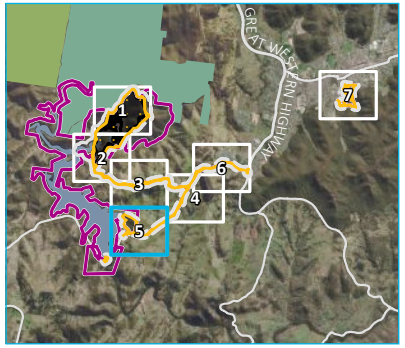
Biodiversity Development Assessment Report

Figure 6.2

EMM creating opportunities

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)

Targeted fauna survey
- Call playback survey
- Raptor targeted survey
- Passive acoustic survey

Cockatoo area search
- Gang-gang Cockatoo and Glossy Black Cockatoo
- Glossy Black Cockatoo
- Gang-gang Cockatoo

Survey tracks during breeding seasons
- Glossy Black-Cockatoo and Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Gang-gang Cockatoo

Plant community type
- Unvegetated

PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest
- Derived sedgeland

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
- Moderate
- Poor
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland
- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Targeted fauna surveys- Birds
Map 5 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.2

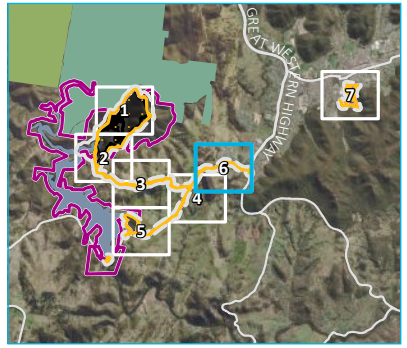
Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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creating opportunities

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)

Targeted fauna survey
- Call playback survey
- Raptor targeted survey
- Passive acoustic survey

Cockatoo area search
- Gang-gang Cockatoo and Glossy Black Cockatoo
- Glossy Black Cockatoo
- Gang-gang Cockatoo

Survey tracks during breeding seasons
- Glossy Black-Cockatoo and Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Gang-gang Cockatoo

Plant community type
- Planted non-indigenous native plants
- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest
- Exotic woody vegetation

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest
- Moderate

Existing environment
- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Targeted fauna surveys- Birds
Map 6 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.2

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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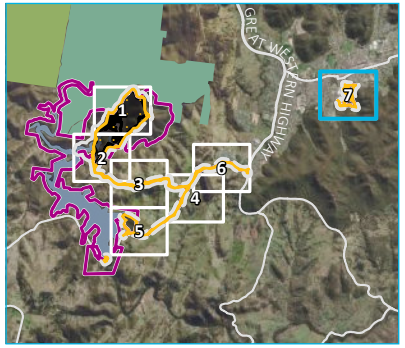
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creating opportunities

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)

Targeted fauna survey
- Call playback survey
- Raptor targeted survey
- Passive acoustic survey

Cockatoo area search
- Gang-gang Cockatoo and Glossy Black Cockatoo
- Glossy Black Cockatoo
- Gang-gang Cockatoo

Survey tracks during breeding seasons
- Glossy Black-Cockatoo and Gang-gang Cockatoo
- Glossy Black-Cockatoo
- Gang-gang Cockatoo

Plant community type
- Unvegetated

PCT 3385 | Southern Tableland Creekflat Swamp Woodland
- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3687 | Newnes Plateau Peppermint-Ash Tall Forest
- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment
- Major road
- Minor road
- NPWS reserve
- State forest

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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Targeted fauna surveys- Birds

Map 7 of 7

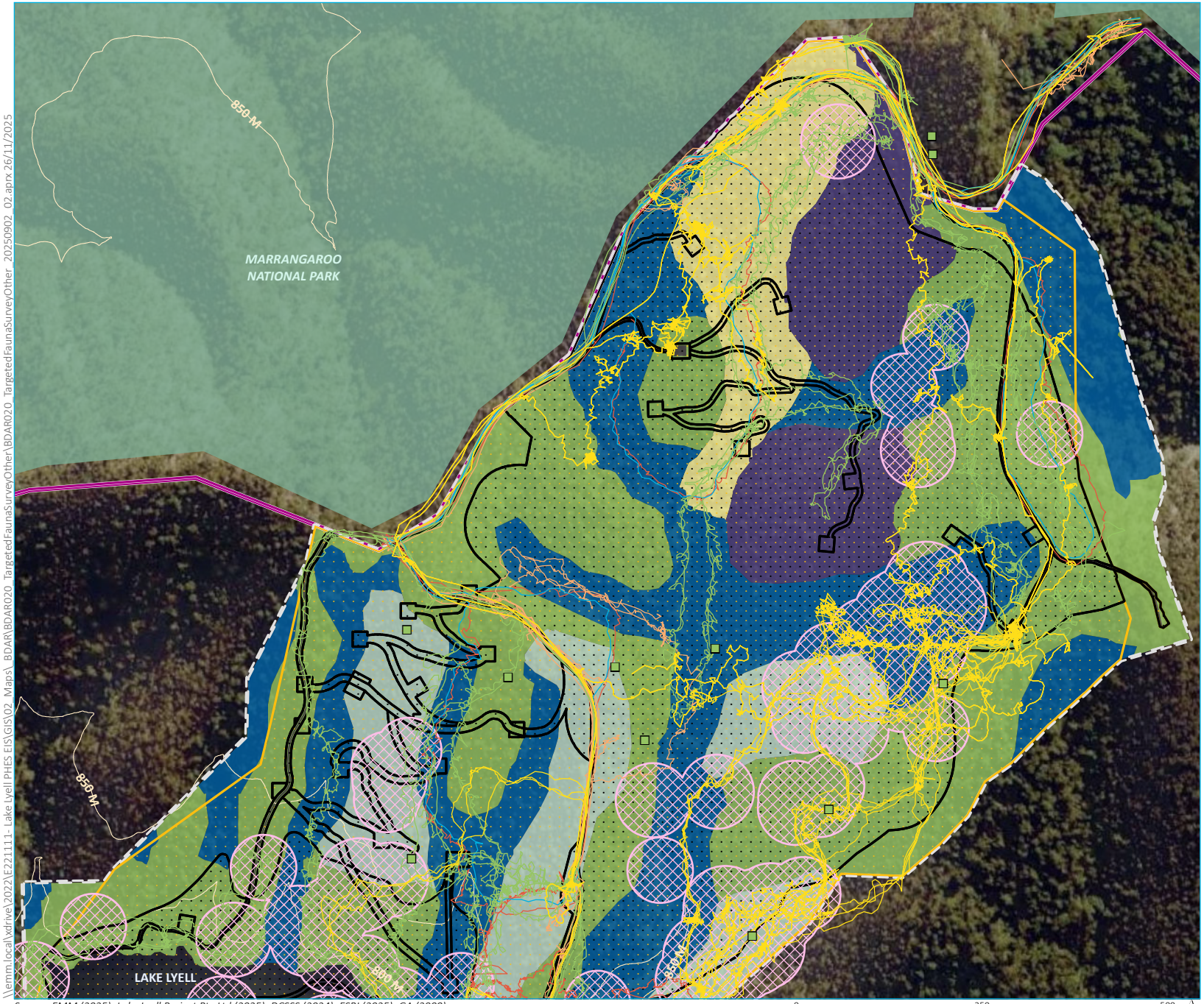
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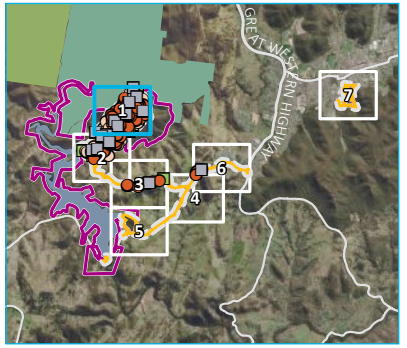
Biodiversity Development Assessment Report

Figure 6.2

EMM creating opportunities

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KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Purple Copper Butterfly Moderate to High Potential habitat
- Contour
- Ultrasonic bat call survey
- Reptile active search location

Remote camera survey
- Brush-tailed Phascogale and Squirrel Glider
- Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider

Targeted fauna survey
- Koala/Dog survey transect
- Purple Copper Butterfly survey transect

Spotlighting transect
- November 2023
- December 2023
- February 2024

Plant community type
- Unvegetated

PCT 3211 | Central Tableland Montane Wet Forest
- Moderate

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest
- Moderate

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest
- High

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest
- High

PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest
- High

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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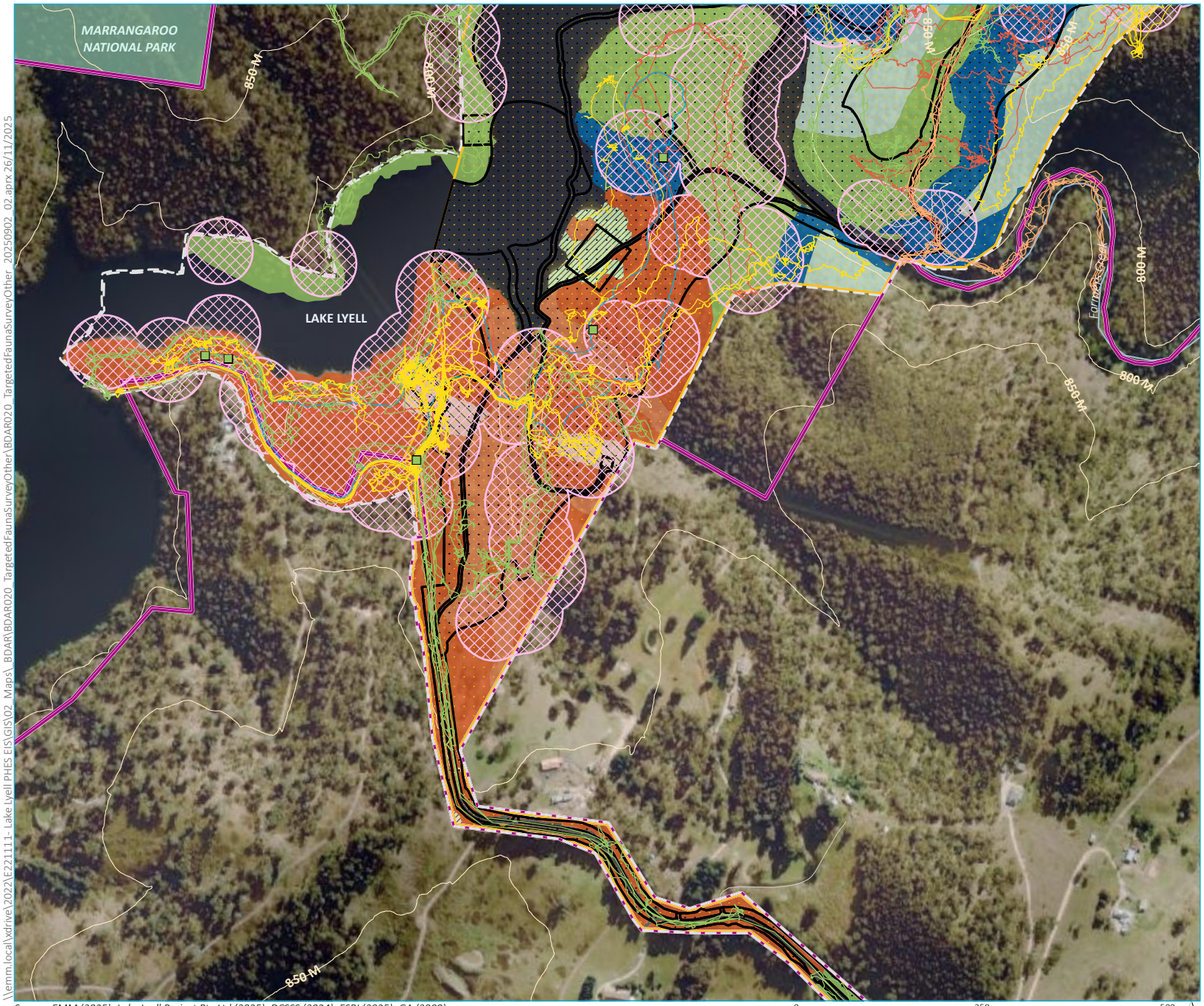
GDA2020 MGA Zone 56

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Targeted fauna surveys- other species
Map 1 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.3

EMM
creating opportunities



KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Purple Copper Butterfly Moderate to High Potential habitat
- Contour
- Ultrasonic bat call survey
- Reptile active search location

Remote camera survey

- Brush-tailed Phascogale and Squirrel Glider
- Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider

Targeted fauna survey

- Koala/Dog survey transect
- Purple Copper Butterfly survey transect

Spotlighting transect

- November 2023
- December 2023
- February 2024

Plant community type

- Unvegetated

PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest

- Derived exotic grass or herbs

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate
- Poor
- Derived shrubland

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Moderate

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

PCT 3747 | Southern Tableland Western Hills Scribbly Gum Forest

- High

Existing environment

- Minor road
- Named watercourse

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

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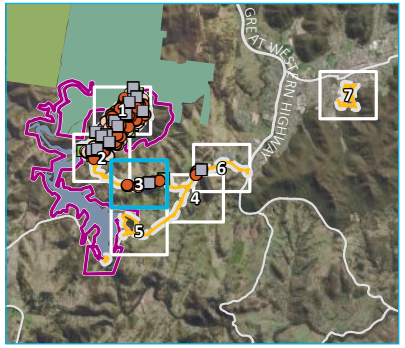
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Targeted fauna surveys- other species
Map 2 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.3

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Purple Copper Butterfly Moderate to High Potential habitat
- Contour
- Ultrasonic bat call survey
- Reptile active search location

Remote camera survey

- Brush-tailed Phascogale and Squirrel Glider
- Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider

Targeted fauna survey

- Koala/Dog survey transect
- Purple Copper Butterfly survey transect

Spotlighting transect

- November 2023
- December 2023
- February 2024

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland

- Moderate

PCT 3735 | Central Tableland Peppermint Shrub-Grass Forest

- High

Existing environment

- Minor road
- Named watercourse

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

N

Targeted fauna surveys- other species
Map 3 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.3

EMM
creating opportunities



KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Purple Copper Butterfly Moderate to High Potential habitat
- Contour
- Ultrasonic bat call survey
- Reptile active search location

Remote camera survey

- Brush-tailed Phascogale and Squirrel Glider
- Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider

Targeted fauna survey

- Koala/Dog survey transect
- Purple Copper Butterfly survey transect

Spotlighting transect

- November 2023
- December 2023
- February 2024

Plant community type

- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs
- Exotic woody vegetation

Existing environment

- Major road
- Minor road
- Named watercourse

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

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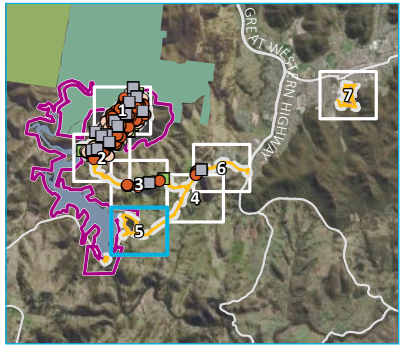
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Targeted fauna surveys- other species
Map 4 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.3

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Purple Copper Butterfly Moderate to High Potential habitat
- Contour
- Ultrasonic bat call survey
- Reptile active search location

Remote camera survey
- Brush-tailed Phascogale and Squirrel Glider
- Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider

Targeted fauna survey
- Koala/Dog survey transect
- Purple Copper Butterfly survey transect

Spotlighting transect
- November 2023
- December 2023
- February 2024

Plant community type
- Unvegetated

PCT 3347 | Southern Tableland Creekflat Ribbon Gum Forest
- Derived sedgeland

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest
- Moderate
- Poor
- Derived exotic grass or herbs

PCT 3367 | Central Tableland Granites Grassy Box Woodland
- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment
- Major road
- Minor road
- Named watercourse

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

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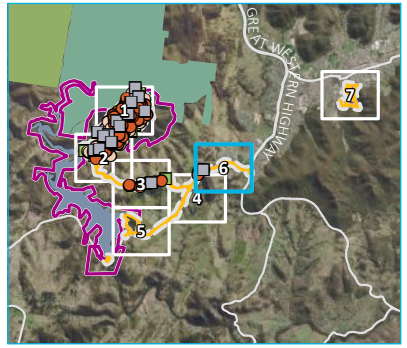
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Targeted fauna surveys- other species
Map 5 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.3

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Purple Copper Butterfly Moderate to High Potential habitat
- Contour
- Ultrasonic bat call survey
- Reptile active search location

Remote camera survey

- Brush-tailed Phascogale and Squirrel Glider
- Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider

Targeted fauna survey

- Koala/Dog survey transect
- Purple Copper Butterfly survey transect

Spotlighting transect

- November 2023
- December 2023
- February 2024

Plant community type

- Planted non-indigenous native plants
- Unvegetated

PCT 3348 | Southern Tableland Granites Ribbon Gum Grassy Forest

- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3369 | Central Tableland Ranges Peppermint-Gum Grassy Forest

- Exotic woody vegetation

PCT 3650 | Goulburn-Lithgow Ranges Silvertop Ash Forest

- Moderate

Existing environment

- Major road
- Minor road
- Named watercourse

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

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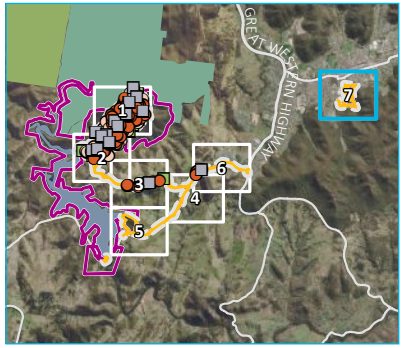
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Targeted fauna surveys- other species
Map 6 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.3

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Construction envelope
- Ecology study area (offset for clarity)
- Purple Copper Butterfly Moderate to High Potential habitat
- Contour
- Ultrasonic bat call survey
- Reptile active search location

Remote camera survey
- Brush-tailed Phascogale and Squirrel Glider
- Brush-tailed Phascogale, Eastern Pygmy Possum and Squirrel Glider

Targeted fauna survey
- Koala/Dog survey transect
- Purple Copper Butterfly survey transect

Spotlighting transect
- November 2023
- December 2023
- February 2024

Plant community type
- Unvegetated

PCT 3385 | Southern Tableland Creekflat Swamp Woodland
- Moderate
- Poor
- Derived native grassland
- Derived exotic grass or herbs

PCT 3687 | Newnes Plateau Peppermint-Ash Tall Forest
- Moderate
- Poor derived native grassland
- Derived exotic grass or herbs

Existing environment
- Major road
- Minor road

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

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Targeted fauna surveys- other species
Map 7 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.3

EMM
creating opportunities

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6.3.5 Targeted survey results

i Flora

No threatened flora species were recorded during the threatened flora surveys.

ii Fauna

The results of targeted surveys are summarised below for each group of species.

a Diurnal birds

Three dual credit threatened bird species were recorded during the diurnal bird survey. Survey results summarised in Table 6.13.

Table 6.13 Diurnal bird results

Scientific name	Common name	BC Act Status	EPBC Act Status	BAM credit type	Observations	Breeding activity
Callocephalon fimbriatum	Gang-gang Cockatoo	E	E	Dual	Seen and heard in multiple location on site incidentally and during targeted surveys.	Breeding activity confirmed on site. Pairs of birds observed entering and exiting hollows in 11 locations and in some cases, renovation of hollows was observed. See Photograph 6.1.
Calyptorhynchus lathami lathami	Glossy Black-Cockatoo	V	V	Dual	A pair was incidentally observed foraging in a patch of black she-oak (*Allocasuarina littoralis*) in June 2023. Chewed cones seen throughout the single patch of *Allocasuarina* spp. on or adjacent to the site.	Possible breeding activity observed on site. A pair observed foraging in a patch of black she-oak (*Allocasuarina littoralis*) in June 2023. Birds were heard calling from a stationary position at around 4:30 pm on 5 June 2024 and a pair of birds was observed flying through the site on the same day. The late afternoon record is considered indicative of a possible nesting in that location.
Haliaeetus leucogaster	White-bellied Sea-eagle	V	-	Dual	A single adult bird incidentally recorded hunting waterfowl over Lake Lyell in June and December 2023.	No pairs nor any potential nests observed on or adjacent to the site. A single moderately large raptor nest was seen in the construction envelope. It was too small to be attributable to White-bellied Sea-eagle. No birds were seen on or around the nest during surveys.



Photograph 6.1 Examples of observed Gang-gang Cockatoo breeding activity

As no individuals and no breeding activity was recorded for the other diurnal dual credit bird species (Little Eagle, Superb Parrot, and Square-tailed Kite), no further assessment is required.

b Nocturnal birds

Two threatened species-credit nocturnal bird species were recorded during the nocturnal bird survey. Survey results summarised in Table 6.14.

Table 6.14 Nocturnal bird results

Scientific name	Common name	BC Act Status	EPBC Act Status	BAM credit type	Observations
Ninox strenua	Powerful Owl	V	-	Dual	Observed in multiple locations north of Lake Lyell during the species' breeding season via call-playback, song meter and stag watch / listening / spotlighting surveys.
Tyto tenebricosa	Sooty Owl	V	-	Dual	Observed in multiple locations north of Lake Lyell during the species' breeding season via call-playback, song meter and stag watch / listening / spotlighting surveys.

As no individuals of any other nocturnal threatened bird species were observed, no further assessment is required for those species.

c Arboreal mammals

A single threatened arboreal mammal species, the Koala, was recorded during the arboreal mammal survey. Survey results are summarised in Table 6.15.

Table 6.15 Arboreal mammal results

Scientific name	Common name	BC Act Status	EPBC Act Status	BAM credit type	Observation method
Phascolarctos cinereus	Koala	E	E	Species	Koala detection dogs. Three separate finds (clusters of Koala scats), about 600 m to the south of Mount Walker Road on 19/03/2024. All three finds were within about 20 to 30 m of each other and identified by experienced detection dogs and validated by two dog handlers/ecologists very experienced in Koala scat identification.

d Microbats

Three threatened microbat species were recorded with a high degree of confidence (definite calls) in the construction envelope, as summarised in Table 6.16. Ultrasonic bat call analysis was undertaken by Amy Rowles of Corymbia Ecology and reports are included in Appendix D.

The Southern Myotis, a species-credit species, was recorded by ultrasonic recording with high confidence in multiple locations around Lake Lyell. Calls, possibly attributable to the species, were also recorded in one location on Magpie Hollow Road.

The Eastern Coastal Free-tailed Bat, an ecosystem credit species, was also detected, but this species does not generate a species credit requirement.

The Large Bent-winged Bat is a dual credit species that was detected, but only breeding habitat and land within 100 m of breeding habitat, generates a species credit requirement. As the construction envelope does not contain any breeding habitat, nor is it within 100 m of any location likely to contain breeding habitat, species credit requirements are not generated for this species.

Many calls attributable to more than one species of bat due to overlaps in call characteristics were recorded. Among the list of bat species that may have produced these calls are a number of common and widespread species and the following threatened species:

- Eastern Cave Bat (*Vespadelus troughtoni*)
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*).

The Eastern Cave Bat is not known or predicted to occur in either of the relevant IBRA subregions. It is most likely that the observed calls are of the common and widespread Little Forest Bat (*Vespadelus vulturnus*) which cannot be differentiated from Eastern Cave Bat where the species are sympatric (Pennay, Law, and Reinhold 2004).

The Eastern False Pipistrelle and Greater Broad-nosed Bat are widespread ecosystem credit species, that are assumed to occur in the construction envelope, and do not generate species-specific credits requirements.

A summary of the threatened microbats detected is provided in Table 6.16.

Table 6.16 Threatened microbats positively identified in the construction envelope

Scientific name	Common name	BC Act Status	EPBC Act Status	BAM credit type	Observation method
Miniopterus orianae oceanensis	Large Bent-winged Bat	V	-	Dual	Recorded by ultrasonic recording with high confidence (Definite).
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	V	-	Ecosystem	Recorded by ultrasonic recording with high confidence (Definite).
Myotis macropus	Southern Myotis	V	-	Species	Recorded by ultrasonic recording with high confidence (Definite).

e Reptiles

No threatened reptile species were detected during survey efforts.

f Butterfly surveys

The Purple Copper Butterfly was not detected in the construction envelope or elsewhere in the project area during targeted surveys. A single individual was incidentally recorded in a regularly slashed powerline easement on 6 October 2023 approximately 300 m from the construction envelope in Marrangaroo National Park (refer to Photograph 6.2).

Individuals of Purple Copper Butterfly were observed at a local reference population at Hermitage Flat during each survey period on the following dates 20 September 2023, 3 October 2023 and 18 October 2023.



Photograph 6.2 Purple Copper Butterfly observed incidentally in Marrangaroo National Park

6.4 Step 5: Determination of the area or count of species and species polygons

For species identified as present in Step 4, a species polygon was developed including relevant vegetation zones of associated PCTs that contain relevant habitat constraints and buffer distances buffer distances specified in the TBDC (BCS 2025b).

Table 6.17 provides descriptions of the species polygons prepared for the calculation of species credit requirements, based on the results of surveys and habitat in the disturbance footprint. Figure 6.4 to Figure 6.9 show the species polygon for each species.

Table 6.17 Fauna species polygon description

Scientific name	Common name	Habitat with potential to generate species polygons considering associated PCTs and habitat and geographic constraints (where applicable)	Species polygon description
Callocephalon fimbriatum	Gang-gang Cockatoo	Areas of the following PCTs; 3211, 3348, 3367, 3369, 3650, 3735, 3747.	Areas habitat with potential to generate species polygons located within a 200 m buffer around locations where probable breeding activity was observed. Figure 6.4 shows the species polygon for this species.
Calyptorhynchus lathami lathami	South-eastern Glossy Black-cockatoo	Areas of the following PCTs; 3211, 3348, 3367, 3369, 3650, 3735, 3747.	Areas of potential species polygon-generating habitat that are located within a 200 m buffer around locations where probable breeding activity was observed. Figure 6.5 shows the species polygon for this species.

Scientific name	Common name	Habitat with potential to generate species polygons considering associated PCTs and habitat and geographic constraints (where applicable)	Species polygon description
Myotis macropus	Southern Myotis	Areas of the following PCTs 3211, 3347, 3348, 3367, 3369, 3385, 3650, 3687, 3735, 3747 where they occur within 200 m of waterbodies with permanent pools/stretches 3 m or wider.	Areas of potential species polygon-generating habitat, except for Sedge, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and only a very low diversity of disturbance-tolerant native ground layer plants and are unlikely to have any greater value to the species than cleared land.
Ninox strenua	Powerful Owl	Areas of the following PCTs where they contain a living or dead tree with a hollow >20 cm diameter that occurs >4 metres above the ground; 3211, 3348, 3367, 3369, 3650, 3735, 3747.	Areas of potential species polygon-generating habitat that are located within a 800 m buffer around locations where the species was observed. Figure 6.6 shows the species polygon for this species.
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	Areas of the following PCTs where they contain patches of *Bursaria spinosa* or are within 40m of such patches and occur above 800 m altitude; 3347, 3348, 3367, 3369, 3650, 3735, 3747.	The species was not recorded in the construction envelope but was recorded approximately 300 m away. Surveys were not comprehensive due to project timing, conflicting survey guidance, and difficulty in accessing sites for repeat visits during appropriate seasonal and climatic conditions. As such, the species polygon encompasses habitat based on that identified in scientific literature and discussions with CPHR. Available scientific literature suggest that the species is only likely to persists in very low numbers in areas that have not been subject to recent fire or physical disturbance, making it very difficult to detect in such circumstances NSW TSSC 2024. The species exhibits great variation both in its 'apparent' presence or absence and its actual numbers from year to year at each site. The apparent disappearance of the species from the isolated Kennedy Park site for several years and its subsequent reappearance was attributed to the persistence of the species on the site at undetectably low levels for a period of four years (NSW TSSC 2024). Almost all known sites are associated with significant levels of physical disturbance or frequent fire that have resulted in an open vegetation structure and an understorey dominated, or well represented, by *Bursaria spinosa* (NSW NPWS 2001). When present in otherwise comparable habitat, butterfly activity levels appear to be correlated with the amount of fresh young *Bursaria spinosa* leaves available (Nally, pers comm., 2016 in TSSC 2016a). Without new blackthorn growth promoted by post-disturbance conditions, *Bursaria*

Scientific name	Common name	Habitat with potential to generate species polygons considering associated PCTs and habitat and geographic constraints (where applicable)	Species polygon description
			spinosa plants often become unsuitable habitat, and the Purple Copper Butterfly can become locally extinct (Nally, pers comm., 2016 in TSSC 2016a). The density and spatial arrangement of *Bursaria spinosa* appears to largely determine the number of adults present in an area of habitat with closely spaced plants with intertwining branchlets thought to provide the most accessible grazing for larvae (Common & Waterhouse 1981; Dexter & Kitching 1991a in NSW NPWS 2001). Due to the difficulty in detecting the species where it occurs at low density, a species polygon has been prepared that includes the most suitable habitat for the species, including areas above 800 m altitude that contain larger patches of *Bursaria spinosa* (> 5 plants within 5 metres of one-another). Such larger patches were considered to be the most suitable habitat as "larvae feed on young growth of the host plant and prefer clumps of plants with intertwining branches, as larvae do not traverse open ground between plants" (NPWS 2001 in (NSW TSSC 2024)). The species polygon does not include areas of potential habitat in the existing power transmission corridor that have been recently disturbed and were adequately surveyed. As such, if present, the species would be expected to occur at high density and so readily detectible. Figure 6.7 shows the species polygon for this species.
Phascolarctos cinereus	Koala	Areas of the following PCTs which contain koala use trees as defined in the "Koala (Phascolarctos cinereus): Biodiversity Assessment Method Survey Guide for information on targeted survey requirements and mapping species polygons"; 3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747.	A species polygon was created for all vegetation zones of all PCTs, excluding areas lacking canopy cover (derived shrubland, DNG and exotic grasslands). Figure 6.8 shows the species polygon for this species.
Tyto tenebricosa	Sooty Owl	Areas of the following PCTs where they contain a living or dead tree with a hollow >20 cm diameter that occurs >4 m above the ground; PCTs 3211, 3650 which are associated with the species, and PCTs 3369 and 3735 in which the species was also recorded.	Areas of potential species polygon-generating habitat that are located within a 800 m buffer around locations where the species was observed. Figure 6.9 shows the species polygon for this species.

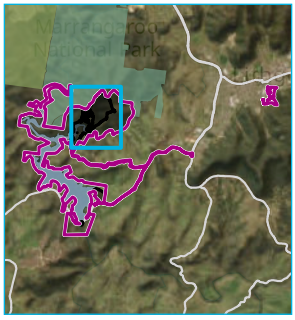


Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

N



KEY

- Project area
- Disturbance footprint
- Gang-gang Cockatoo breeding activity observation
- Gang-gang Cockatoo species polygon
- Gang-gang Cockatoo breeding activity buffer (200 m)

Existing environment

- Minor road
- Vehicular track
- Waterbody
- NPWS reserve

INSET KEY

- Major road
- NPWS reserve
- State forest

Gang-gang Cockatoo species polygon

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.4

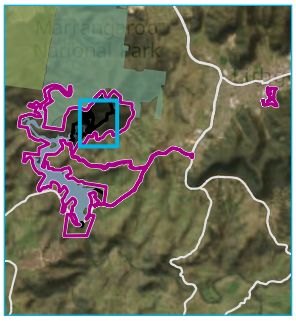
EMM
creating opportunities

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

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GDA2020 MGA Zone 56
N



KEY

- Project area
- Disturbance footprint
- Glossy Black Cockatoo breeding activity observation
- Foraging habitat (*Allocasuarina* patch)
- Glossy Black Cockatoo species polygon
- Glossy Black Cockatoo breeding activity buffer (200 m)

Existing environment

- Vehicular track
- Waterbody
- NPWS reserve

INSET KEY

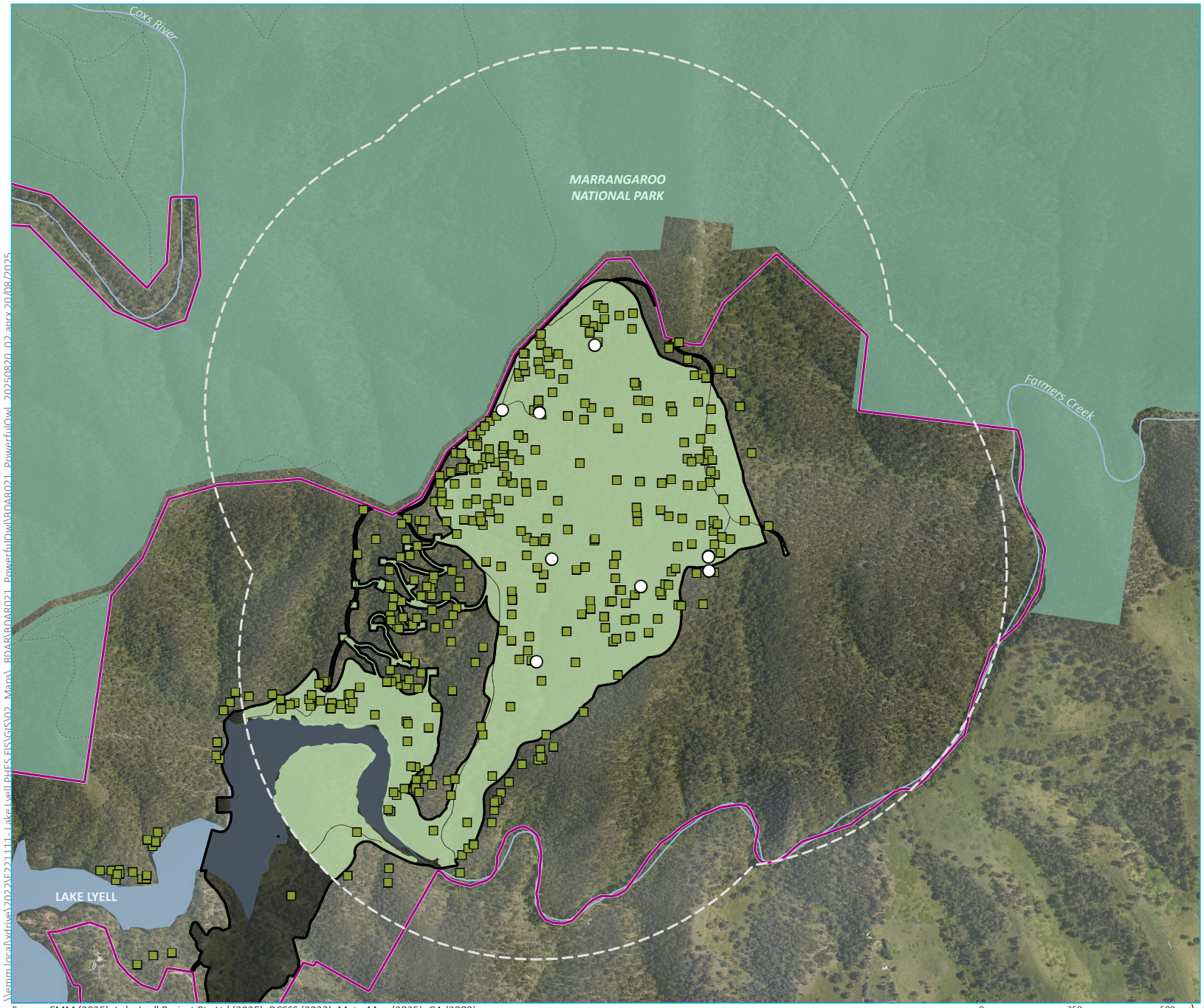
- Major road
- NPWS reserve
- State forest

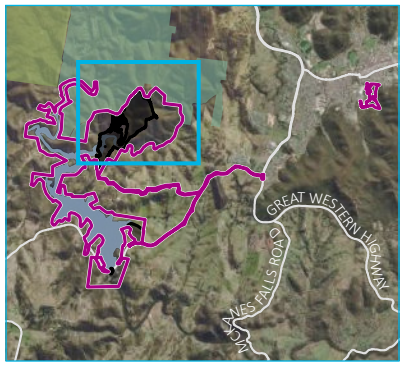
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Glossy Black Cockatoo species polygon

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.5

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Large hollow (20 cm of larger entrance diameter)
- Powerful Owl recorded observation
- Powerful Owl species polygon
- Powerful Owl buffer (800 m)

Existing environment

- Minor road
- Vehicular track
- Named watercourse
- Named waterbody

INSET KEY

- Major road
- NPWS reserve
- State forest

Powerful Owl species polygon

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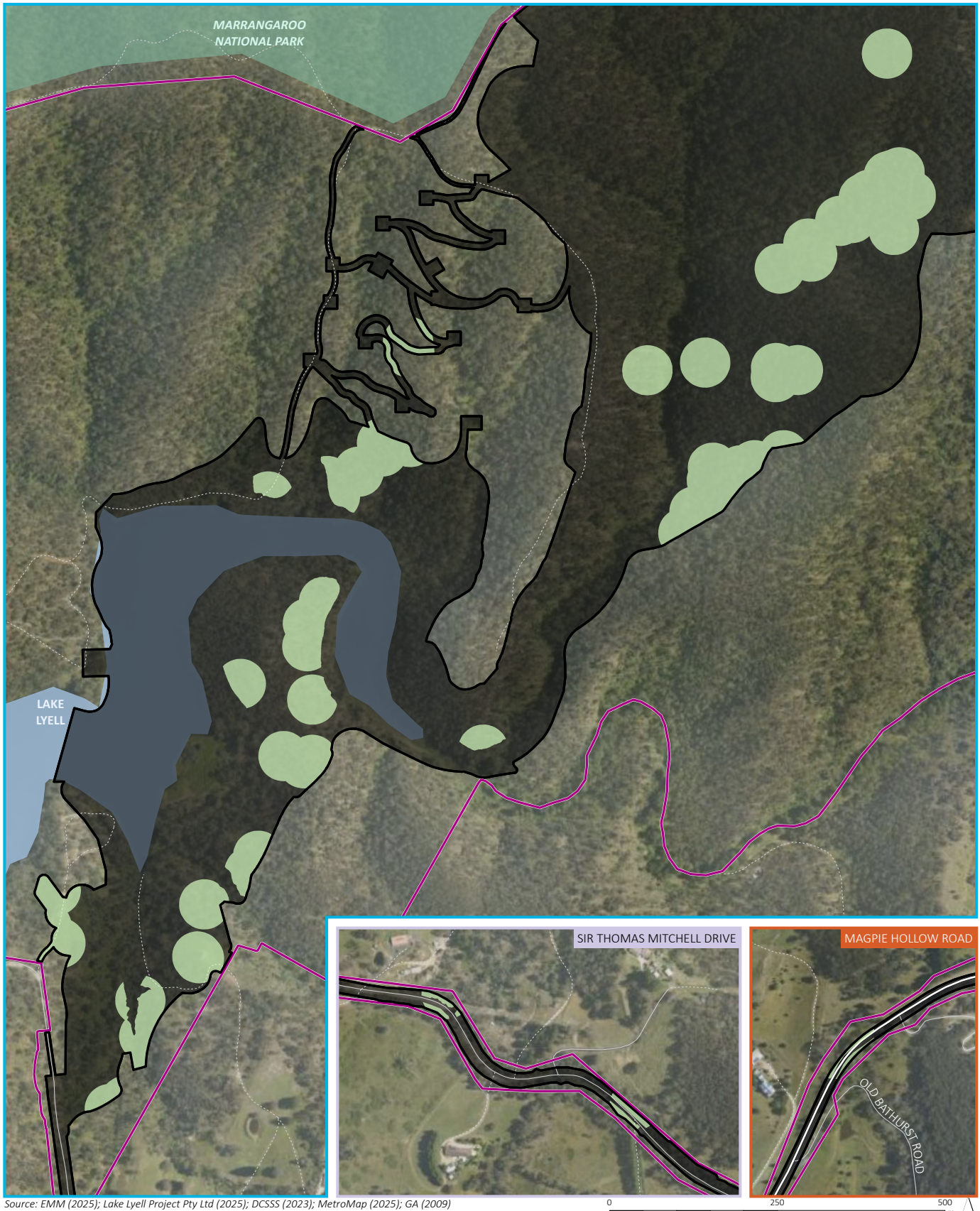
Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

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Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.6

EMM
creating opportunities



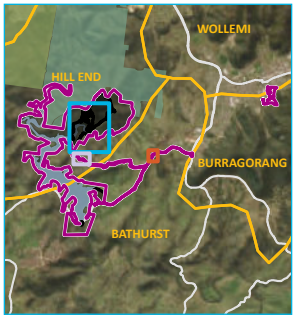
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KEY

- Project area
- Disturbance footprint
- Purple Copper Butterfly species polygon

Existing environment

- Minor road
- Vehicular track
- NPWS reserve

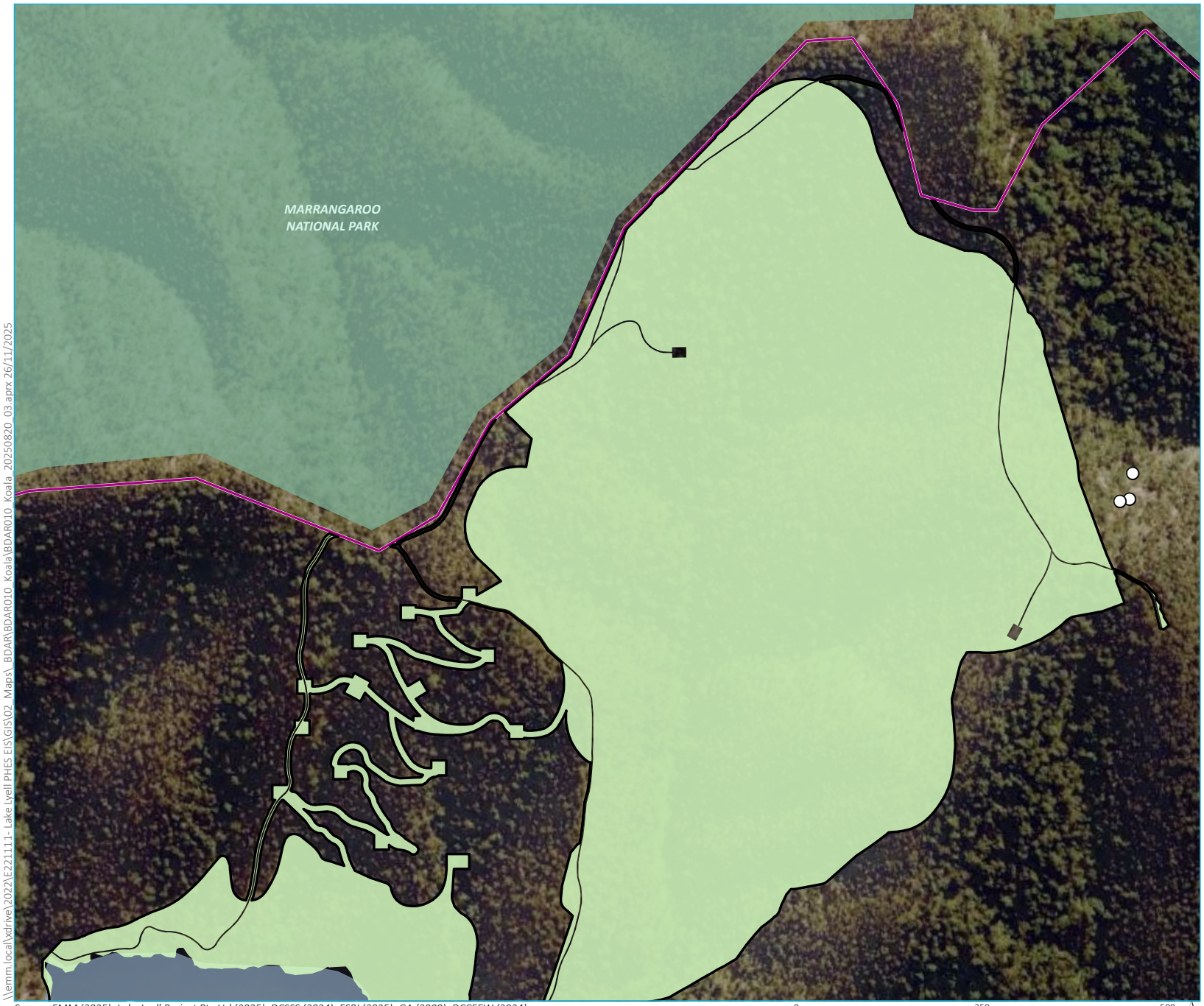
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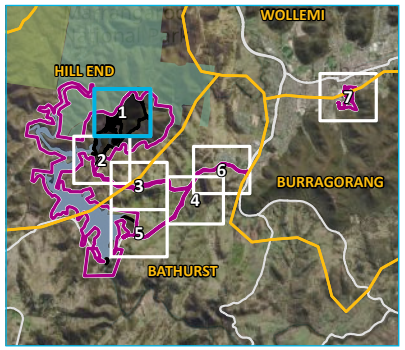
- Major road
- IBRA subregion
- NPWS reserve
- State forest

Purple Copper Butterfly species polygon

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.7

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Koala observation
- Koala species polygon

Existing environment

- Named waterbody
- NPWS reserve
- State forest
- IBRA subregion boundary

Koala species polygon
Map 1 of 7

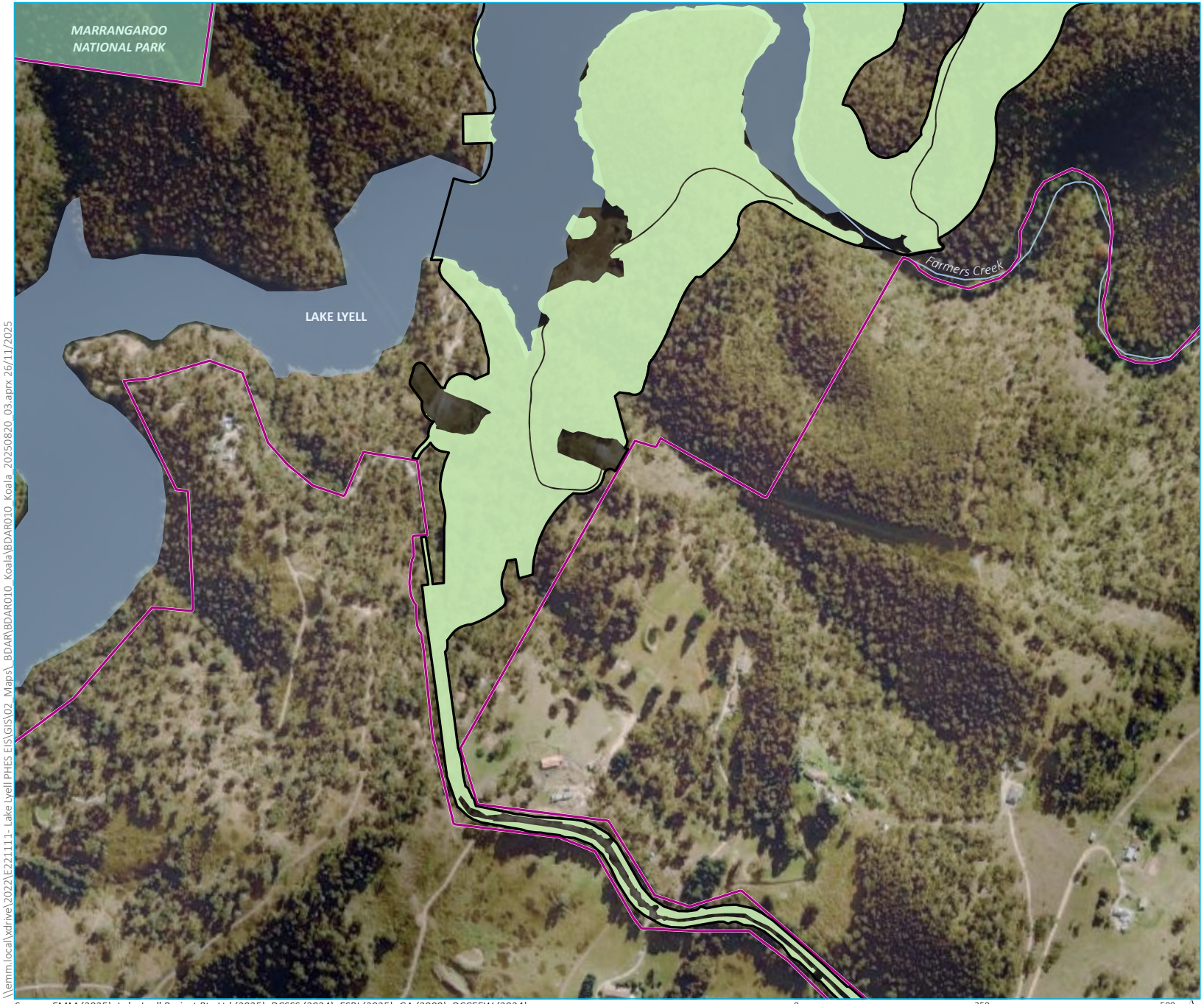
Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.8

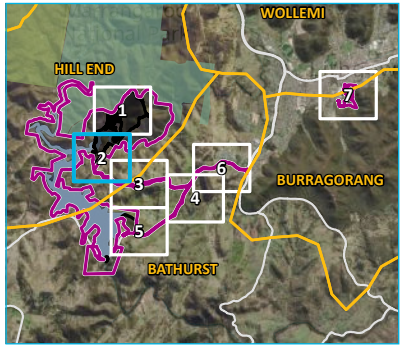
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creating opportunities

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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KEY

- Project area
- Disturbance footprint
- Koala observation
- Koala species polygon

Existing environment

- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- IBRA subregion boundary

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

0 250 500 m

GDA2020 MGA Zone 56

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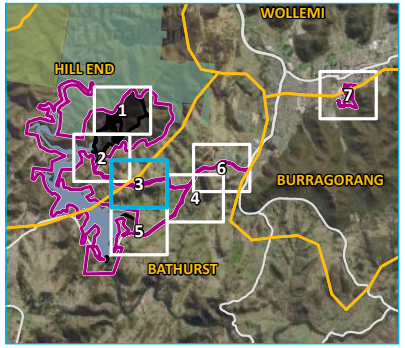
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Koala species polygon
Map 2 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.8

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Koala observation
- Koala species polygon

Existing environment

- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion boundary

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

0 250 500 m

GDA2020 MGA Zone 56

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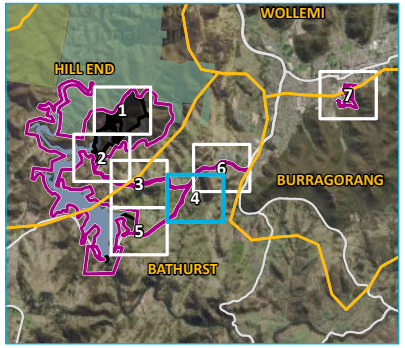
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Koala species polygon
Map 3 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.8

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Koala observation
- Koala species polygon

Existing environment

- Major road
- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion boundary

Koala species polygon
Map 4 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.8

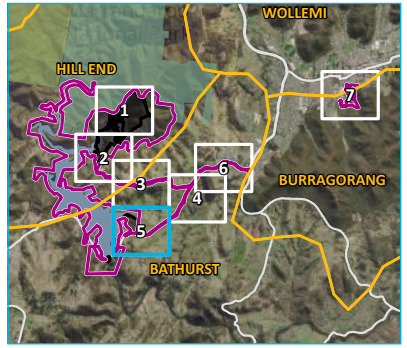
EMM
creating opportunities

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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GDA2020 MGA Zone 56
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KEY

- Project area
- Disturbance footprint
- Koala observation
- Koala species polygon

Existing environment

- Major road
- Named watercourse
- Named waterbody
- NPWS reserve
- State forest
- IBRA subregion boundary

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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GDA2020 MGA Zone 56

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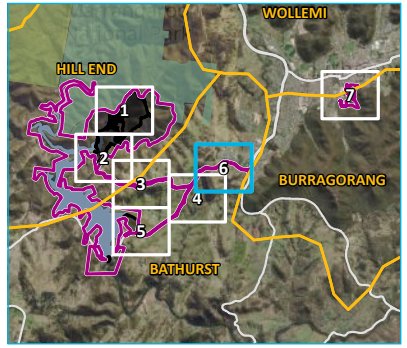
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Koala species polygon
Map 5 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.8

EMM
creating opportunities





KEY

- Project area
- Disturbance footprint
- Koala observation
- Koala species polygon

Existing environment

- Major road
- Named watercourse
- NPWS reserve
- State forest
- IBRA subregion boundary

Koala species polygon
Map 6 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.8

EMM
creating opportunities

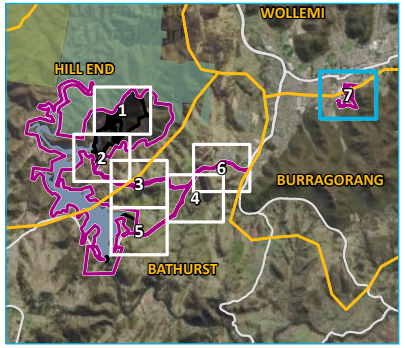
Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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GDA2020 MGA Zone 56

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KEY

- Project area
- Disturbance footprint
- Koala observation
- Koala species polygon

Existing environment

- Major road
- NPWS reserve
- State forest
- IBRA subregion boundary

Koala species polygon
Map 7 of 7

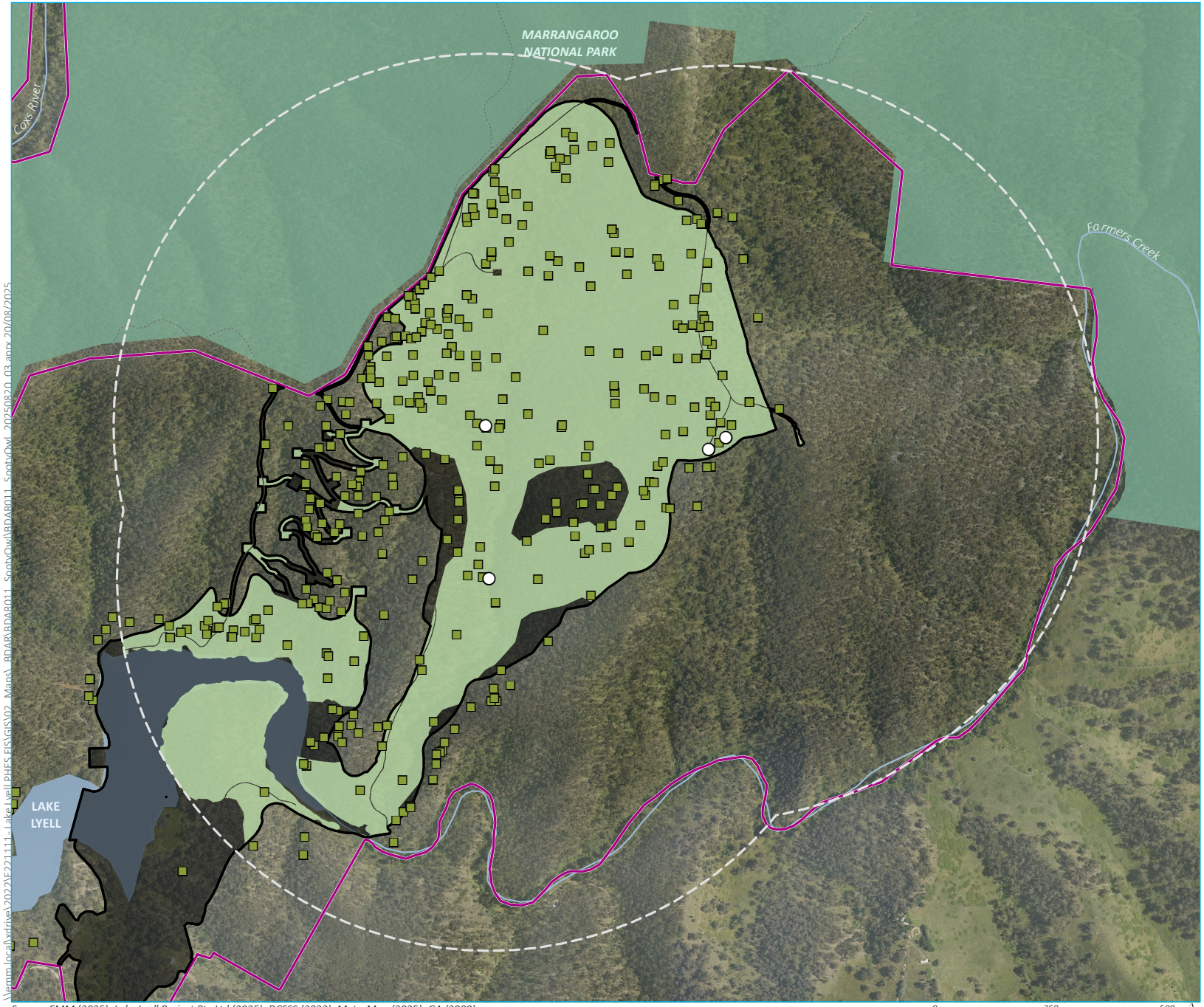
Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.8

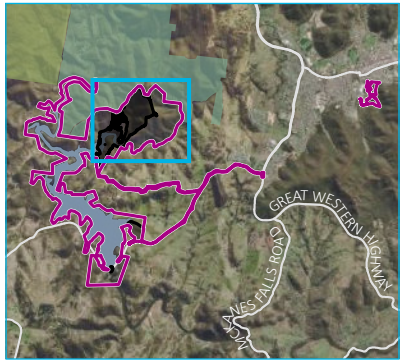
Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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GDA2020 MGA Zone 56
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creating opportunities





KEY

- Project area
- Disturbance footprint
- Large hollow (20 cm of larger entrance diameter)
- Sooty Owl recorded observation
- Sooty Owl species polygon
- Sooty Owl buffer (800 m)

Existing environment

- Minor road
- Vehicular track
- Named watercourse
- Named waterbody

INSET KEY

- Major road
- NPWS reserve
- State forest

Sooty Owl species polygon

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2023); MetroMap (2025); GA (2009)

0 250 500 m

GDA2020 MGA Zone 56

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Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 6.9

EMM
creating opportunities

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6.5 Step 6: Determination of the habitat condition within the species polygon for species assessed by area

The habitat condition within species polygons was determined by using the vegetation integrity score for each vegetation zone that is wholly or partially within the species polygon. Table 6.18 and Table 6.19 show the habitat condition within species polygons for species assessed by area for early works, separated by IBRA subregions.

Table 6.20 shows the habitat condition within species polygons for species assessed by area for main works, all within the Hill End IBRA Subregion.

Table 6.18 Habitat condition within species polygons for species assessed by area for early works in the Hill End subregion

Scientific name	Common name	Vegetation zones in species polygon	Vegetation integrity score	Extent of impact in species polygon (ha)
Callocephalon fimbriatum	Gang-gang Cockatoo	3747_High	80.5	1.02
		3735_High	93.9	0.98
		3650_High	81.4	0.14
		3369_Moderate	97.6	0.64
		3211_Moderate	76.4	0.22
Calyptorhynchus lathami lathami	South-eastern Glossy Black Cockatoo	3735_High	93.9	0.06
		3369_Moderate	97.6	0.02
Myotis macropus	Southern Myotis	3747_High	80.5	0.24
		3735_High	93.9	0.89
		3367_Moderate	86.1	0.30
		3348_Moderate	64.9	0.18
		3369_Moderate	97.6	0.46
		3367_Poor	79.5	0.12
Ninox strenua	Powerful Owl	3747_High	80.5	1.05
		3735_High	93.9	1.72
		3650_High	81.4	0.19
		3367_Moderate	86.1	0.01
		3369_Moderate	97.6	1.20
		3211_Moderate	76.4	0.48
Paralucia spinifera	Purple Copper Butterfly	3747_High	80.5	0.03
		3735_High	93.9	0.10
		3367_Moderate	86.1	0.01
		3348_Moderate	64.9	0.08
Phascolarctos cinereus	Koala	3747_High	80.5	1.05
		3735_High	93.9	2.23
		3650_High	81.4	0.19
		3367_Moderate	86.1	1.5
		3348_Moderate	64.9	0.18
		3369_Moderate	97.6	1.2

Scientific name	Common name	Vegetation zones in species polygon	Vegetation integrity score	Extent of impact in species polygon (ha)
		3211_Moderate	76.4	0.48
		3367_Poor	79.5	0.17
Tyto tenebricosa	Sooty Owl	3735_High	93.9	1.72
		3650_High	81.4	0.19
		3369_Moderate	97.6	1.2
		3211_Moderate	76.4	0.48

Table 6.19 Habitat condition within the species polygon for species assessed by area for early works in the Bathurst subregion

Scientific name	Common name	Vegetation zones in species polygon	Vegetation integrity score	Extent of impact in species polygon (ha)
Myotis macropus	Southern Myotis	3348_Moderate	72.8	0.99
		3348_Poor	23.4	0.15
		3650_Moderate	82.4	0.05
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	3348_Moderate	72.8	0.08
Phascolarctos cinereus	Koala	3348_Moderate	72.8	2.90
		3348_Poor	23.4	0.36
		3367_Moderate	60.8	0.11
		3650_Moderate	82.4	0.05

Table 6.20 Habitat condition within the species polygon for species assessed by area for main works

Scientific name	Common name	Vegetation zones in species polygon	Vegetation integrity score	Extent of impact in species polygon (ha)
Callocephalon fimbriatum	Gang-gang Cockatoo	3211_Moderate	76.4	1.46
		3367_Moderate	86.1	0.66
		3369_Moderate	97.6	16.25
		3650_High	81.4	3.32
		3735_High	93.9	19.7
		3747_High	89.4	5.7
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	3369_Moderate	97.6	2.33
		3735_High	93.9	1.49
		3747_High	89.4	0.27
Myotis macropus	Southern Myotis	3367_Moderate	86.1	4.9
		3367_Poor	79.5	2.98
		3369_Moderate	97.6	5.13
		3735_High	93.9	11.43
		3747_High	89.4	1.33
Ninox strenua	Powerful Owl	3211_Moderate	76.4	6.82
		3367_Moderate	86.1	0.72
		3367_Poor	79.5	3.42
		3369_Moderate	97.6	24.75
		3650_High	81.4	8.57
		3735_High	93.9	32.87
		3747_High	89.4	6.94
Paralucia spinifera	Purple Copper Butterfly	3735_High	93.9	4.10
		3747_High	89.4	1.77
		3367_DS	59.8	0.52
		3367_Moderate	86.1	1.53
		3367_Poor	79.5	0.74
		3369_Moderate	97.6	3.07
		3650_High	81.4	0.14
Phascolarctos cinereus	Koala	3735_High	93.9	33.25
		3747_High	89.4	6.94
		3211_Moderate	76.4	6.82

Scientific name	Common name	Vegetation zones in species polygon	Vegetation integrity score	Extent of impact in species polygon (ha)
		3367_Moderate	86.1	5.6
		3367_Poor	79.5	3.92
		3369_Moderate	97.6	24.84
		3650_High	81.4	8.57
Tyto tenebricosa	Sooty Owl	3211_Moderate	76.4	6.82
		3369_Moderate	97.6	24.75
		3650_High	81.4	8.57
		3735_High	93.9	32.88

7 Groundwater dependent ecosystems

Assessments of potential impacts to the terrestrial, aquatic and subterranean groundwater dependent ecosystems (GDE) are provided in Sections 7.1.1 ,7.1.2 and 7.1.3, respectively.

7.1.1 Terrestrial GDEs

In accordance with the Risk Assessment Guidelines for Groundwater Dependant Ecosystems (Serov, Kuginis, & Williams, 2012), terrestrial GDEs have been identified as:

- **Obligate**, represented by PCTs with an entire dependency on groundwater for ecosystem sustainment, typically occurring in areas with a consistently shallow (<0.5 m) watertable and comprising vegetation within swamps, fens and bogs. Obligate GDEs are considered at high risk of ecosystem degradation following watertable drawdown

- **Facultative**, represented by PCTs that have adapted to access groundwater when available however, are not entirely dependent on the presence of groundwater for ecosystem sustainment. Facultative dependence is sub -categorised by a:

    - high level of facultative dependence, relying on groundwater semi -regularly; considered at moderate risk of impact in the event of watertable drawdown

    - opportunistic level of facultative dependence, accessing groundwater when the watertable is elevated after flooding (i.e. vegetation within ephemeral watercourses and drainage lines); considered at low risk of impact in the event of watertable drawdown

    - proportional level of facultative dependence, remaining resilient in the absence of groundwater yet reflected as a proportional change in ecosystem prevalence and health; considered at low risk of impact in the event of watertable drawdown

- **Non dependant**, represented by PCTs that do not require groundwater for ecosystem sustainment, typically occurring in areas with a relatively deep watertable (i.e. vegetation along elevated ridgelines) and considered at negligible risk of impact in the event of watertable drawdown.

To infer dependence, baseline groundwater level monitoring data (refer Section 5 of Groundwater Impact Assessment, EMM, 2025a) was used to infer the depth to watertable across the study area. Table 7.1 provides the characterisation matrix for groundwater dependence. Table 7.2 shows the areas of each PCT respective of the depth to watertable, to characterise groundwater dependence in accordance with the characterisation matrix.

Seven PCTs were identified as groundwater dependant and are presented in Table 7.2. The locations of these GDEs are shown on Figure 6.7 in the Groundwater Impact Assessment (EMM, 2025a). Remaining PCTs were inferred as non-dependant on groundwater.

Table 7.1 Characterisation matrix for terrestrial groundwater dependant ecosystems

Groundwater dependence	Criteria	Risk of impact
Obligate	• more than 50% of the PCT is mapped in areas with groundwater at 0.5 mbgl or less, or • more than 75% of the PCT is mapped in areas with groundwater at 2 mbgl or less.	High
Facultative – high	• more than 50% of the PCT is mapped in areas with groundwater at 2 mbgl or less, and • more than 75% of the PCT is mapped in areas with groundwater at 5 mbgl or less.	Moderate
Facultative – proportional	• more than 75% of the PCT is mapped in areas with groundwater at 5 mbgl or less, but • less than 50% of the PCT is mapped in areas with groundwater at 2 mbgl or less.	Low
Facultative – opportunistic	• more than 50% of the PCT is mapped in areas with groundwater at 5 mbgl or less, but • less than 75% of the PCT is mapped in areas with groundwater at 2 mbgl.	Low
Non -dependent	• evenly distributed across groundwater levels, and • less than 50% of the PCT mapped in areas with groundwater at 5 mbgl or more.	Negligible

Table 7.2 Terrestrial groundwater dependant ecosystem characterisation

PCT	Percentage of PCT overlying groundwater depth				Groundwater dependence
	<0.5 m	<2 m	<5 m	>5 m	
3483	100%	100%	100%	0%	Obligate
3948	100%	100%	100%	0%	Obligate
4063	82%	93%	100%	0%	Obligate
4064	29%	83%	100%	0%	Obligate
3303	17%	61%	92%	9%	Facultative -High
3367	30%	41%	54%	46%	Facultative -Opportunistic
3738	12%	27%	51%	49%	Facultative -Opportunistic

The areas of each PCT within each groundwater level change contour range are presented in Table 7.3. Potential groundwater impacts are considered likely to occur where groundwater modelling predicts watertable drawdown in excess of 0.5 m (the practical limit of the model accuracy) in an area where the existing watertable is at 5 mbgl or shallower.

Table 7.3 Terrestrial groundwater dependant ecosystem impacts

PCT	Area of PCT in each groundwater level change contour range for areas in which the existing where the existing watertable is at 5 mbgl or shallower									Groundwater dependence
	-20 m to -50 m	-10 m to -20 m	-5 m to -10 m	-2 m to -5 m	-1 m to -2 m	-0.5 m to -1 m	-0.2 m to -0.5 m	-0.2 m to +0.2 m	+0.2 m to +0.5 m	
3483	0	0	0	0	0	0	0	0	0	Obligate
3948	0	0	0	0	0	0	0	0	0	Obligate
4063	0	0	0	0	0	0	0	0	0	Obligate
4064	0	0	0	0	0	0	0	0	0	Obligate
3303	0	0	0	0	0	0.21	0.36	0	0	Facultative to High
3367	0	0	0	0	0	0	0	0	0.77	Facultative to Opportunistic
3738	0	0	0	0	0	0	0	0	0	Facultative to Opportunistic

Based on the groundwater modelling, watertable drawdown is predicted to have negligible impacts on terrestrial groundwater dependant ecosystems (GDEs). That is, watertable drawdown is predicted to intercept two terrestrial GDEs (refer to Figure 9.2 and Figure 9.3 of the Groundwater Impact Assessment, EMM, 2025a), comprising:

- one mapped community of PCT 3303 (Central Tableland Ribbon Gum Sheltered Forest), located along Farmers Creek and approximately 750 m south-east of the project power station. The entirety of PCT3303 was inferred to have a facultative-high dependence on groundwater (refer Section 6.7.1 of the Groundwater Impact Assessment, EMM, 2025a)
- one mapped occurrence of PCT 3367 (Central Tableland Granites Grassy Box Woodland), located on an ephemeral watercourse approximately 550 m north-west of the project power station. The entirety of PCT3367 was inferred to have a facultative-opportunistic dependence on groundwater.

Watertable drawdown hydrographs extracted from the groundwater model predicted groundwater drawdown to steadily increase over the construction and operations phases of the project (see Figure 9.5 of the Groundwater Impact Assessment, EMM, 2025a), reaching a maximum value of approximately:

- 3.6 m at PCT 3303
- 1.1 m at PCT 3367.

However, PCT 3303 and PCT 3367 are considered at moderate and low risk of watertable induced impact, respectively. It is also considered that the adjacent watercourses (i.e. the ephemeral watercourse at PCT 3367 and Farmers Creek at PCT 3303) support the majority of the plant communities water requirements. Noting there is minimal impact to baseflow (refer to Section 9.4.2 of the Groundwater Impact Assessment, EMM, 2025a) in these afore-mentioned watercourses, impacts to terrestrial GDEs from potential groundwater drawdown are considered negligible.

The potential for cumulative impacts resulting from the project and Marangaroo Quarry is also considered negligible. That is, the base case model predicts watertable drawdown above 0.2 m (the practical limit of the model accuracy) as isolated areas (separated by approximately 3 km) around the project and Marangaroo Quarry (refer to Section 9.3.5 of the Groundwater Impact Assessment, EMM, 2025a).

Furthermore, following the implementation of control and mitigation management measures outlined in the GIA, it is considered that the residual risk of the potential impacts of groundwater quality are reduced to low likelihood and consequence for all construction and operation processes, both locally and regionally (refer to Section 11.3.2 of the Groundwater Impact Assessment, EMM, 2025a).

7.1.2 Aquatic GDEs

Aquatic ecosystems that interact with groundwater include:

- perennial watercourses (refer Section 4.1.2) which:
  - receive baseflow from the shallow groundwater system during dry periods
  - discharge to the shallow groundwater system during wet periods
- ephemeral streams, receiving groundwater during periods when water levels in the shallow groundwater system are high (i.e. during and immediately after wet periods).

A summary of perennial watercourses is provided in Table 7.4.

Table 7.4 Aquatic GDEs

Watercourse	Catchment	Discharges to	Stream order
Farmers Creek	Hawkesbury -Nepean	Lake Lyell/Coxs River	4
Sandalls Creek		Lake Lyell/Coxs River	4
Coxs River		Lake Burragorang (~50 km south -east of study area)	6
Bowens Creek		Coxs River	4
Jocks Creek		Coxs River	4
Lowther Creek		Coxs River	5
Whites Creek		Coxs River	4
Marangaroo Creek		Coxs River	5
Solitary Creek	Macquarie Bogan	Fish River (~18 km west of study area)	4

Source: Water Management (General) Regulation 2018 hydroline spatial data (DPE, 2022)

Potential impacts to aquatic GDEs may arise through the reduction in habitat, caused by a reduction of groundwater baseflow to watercourses.

Baseflow reduction to the perennial, receiving watercourses within the study area is predicted during construction of the project, with the maximum reduction realised in the fourth year of construction at approximately 3.8 ML/yr. Following construction of the project, ongoing losses are predicted at Lake Lyell (4.2 ML/yr) and Coxs River (0.1 ML/yr) (refer to Section 9.5 of the Groundwater Impact Assessment, EMM, 2025a).

Project induced leakage is predicted from Lake Lyell, with maximum leakage predicted in the fourth year of construction (0.6 ML/yr). Following construction of the project, leakage is predicted from Farmers Creek (0.1 ML/yr) and Lake Lyell (0.4 ML/yr) (refer to Section 9.5 of the Groundwater Impact Assessment, EMM, 2025a).

Given the relatively low reduction in baseflow and increased leakage, reduced water availability is not anticipated to have a significant impact on aquatic GDE habitats.

7.1.3 Subterranean GDEs (stygofauna)

Existing stygofauna are assumed to be like those encountered in other fractured rock systems in NSW. Stygofauna are likely to be more common in bogs and fens, hyporheic zones and shallow fractured rock groundwater systems due to the greater availability of dissolved oxygen and nutrients.

Three stygofauna surveys were undertaken at six bores within the study area on 3 May 2024, 31 May 2024 and 4 July 2024. Stygofauna was not recorded in any bore and so it is considered unlikely that the project will impact stygofauna associated with the regional groundwater systems (refer to Section 5.2.3 of the Groundwater Impact Assessment, EMM, 2025a).

Stage 2 – Impact assessment

8 Impact assessment

This chapter identifies the potential impacts of the project on the biodiversity values. Measures taken to date to avoid and minimise impacts are summarised and recommendations to assist in the design development that further avoids, minimises and mitigates impacts are provided.

8.1 Potential direct and indirect impacts

8.1.1 Direct impacts

The project would result in the following direct impacts on biodiversity:

- loss of approximately 102.04 ha of native vegetation and threatened species habitat with a vegetation integrity (VI) score of greater than 20, which generates a biodiversity offset requirement
- loss of approximately 27.70 ha of vegetation with a VI score of less than 20 that is not considered to be threatened species habitat, and does not generate a biodiversity offset requirement
- loss of 11 trees with hollows that are known or strongly suspected to be utilised by Gang-gang Cockatoos for breeding and loss of up to approximately 568 other trees with hollows of approximately 7 cm or larger entrance diameter, many of which may have potential to be utilised for nesting
- loss of approximately 294 trees with hollows of approximately 20 cm or larger entrance diameter, many of which may have potential to be utilised by Powerful Owls or Sooty Owls for nesting
- loss of potential breeding habitat for the Glossy Black Cockatoo, likely to be utilised by a breeding pair
- loss of approximately 3.6 ha of high-quality foraging habitat for the Glossy Black Cockatoo.

8.1.2 Loss of native vegetation

The project will involve clearing of land and will therefore result in loss of native vegetation in affected areas. A total area of approximately 129.74 ha of native vegetation of varying condition would be lost (refer to Table 8.1).

Table 8.1 Vegetation impacts across early and main works

PCT ID	PCT name	Vegetation formation	Vegetation Class	Percentage cleared (NSW)	Direct impacts (ha) in highly modified condition (VI score <20)	Direct impacts (ha) in better condition (VI score >20)	Direct impacts (ha) in all condition states
3211	Central Tableland Montane Wet Forest	Wet Sclerophyll Forests (Shrubby sub-formation)	Southern Escarpment Wet Sclerophyll Forests	21%	0	7.30	7.30
3347	Southern Tableland Creekflat Ribbon Gum Forest	Grassy Woodlands	Tableland Clay Grassy Woodlands	65%	1.43	0	1.43
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	Grassy Woodlands	Tableland Clay Grassy Woodlands	82%	3.13	3.61	6.74

PCT ID	PCT name	Vegetation formation	Vegetation Class	Percentage cleared (NSW)	Direct impacts (ha) in highly modified condition (VI score <20)	Direct impacts (ha) in better condition (VI score >20)	Direct impacts (ha) in all condition states
3367	Central Tableland Granites Grassy Box Woodland	Grassy Woodlands	Southern Tableland Grassy Woodlands	78%	12.18	12.11	24.29
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	Grassy Woodlands	Southern Tableland Grassy Woodlands	62%	0	26.04	26.04
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	South East Dry Sclerophyll Forests	6%	0	8.81	8.81
3735	Central Tableland Peppermint Shrub-Grass Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	69%	0	35.49	35.49
3747	Southern Tableland Western Hills Scribbly Gum Forest	Dry Sclerophyll Forests (Shrubby sub-formation)	Southern Tableland Dry Sclerophyll Forests	65%	0	8.00	8.00
3385	Southern Tableland Creekflat Swamp Woodland	Grassy Woodlands	Subalpine Woodlands	75%	2.11	0.61	2.72
3687	Newnes Plateau Peppermint-Ash Tall Forest	Dry Sclerophyll Forests (Shrubby sub-foramtion)	Sydney Montane Dry Sclerophyll Forests	3%	8.85	0.08	8.93
Subtotals					**27.70 ha**	**102.04 ha**	
Total							**129.75 ha**

Most native vegetation in the disturbance footprint would generate an ecosystem credit offset requirement as described in Section 11.2.1. Areas that are habitat for species-credit species would also generate species credit requirements as described in Section 6.5.

8.1.3 Indirect impacts

Section 8.2 of BAM (DPIE 2020a) requires the assessment of indirect impacts on native vegetation, threatened ecological communities and threatened species habitats.

Delineation of a project into different management zones allows for direct impacts (i.e. total loss of native vegetation and fauna habitat in a given area) and indirect impacts (e.g. decreasing condition in retained native vegetation and fauna habitats adjacent to direct impacts) to be quantified. The following section describes how the indirect impacts have been defined for the project. Mitigation measures have been provided in Section 8.3.3 to manage these indirect impacts.

The indirect impacts may include:

- edge effect on areas of retained native vegetation
- noise, vibration, dust and light disturbance to native animals in adjacent habitat, particularly during construction

- interruption of animal movement
- vehicle strike impacts on animal populations
- impacts to water quality during construction.

i Edge effects

Edge effects are zones of changed environmental conditions occurring along the edges of habitat fragments. These new environmental conditions along the edges can promote the growth of different plant species (including weeds), supress the growth of other plant species, promote invasion by animals (native and introduced) that specialise in edge habitats, or change the behaviour of resident animals (Moenting, AE & Morris DW 2006). Edge zones can be subject to higher levels of predation by introduced native mammal and bird predators. The distance of edge effects influence can vary, with edge effects in roads having been recorded as extending greater than 1 km (Forman, RT 2000) and as little as 20 m away (Bali, R 2000), (Bali, R 2005), (EMM 2019).

Areas adjacent to the disturbance footprint were inspected during vegetation mapping, where BAM plots and fauna surveys used to determine the characteristics of vegetation and habitat present and their susceptibility to potential edge effects. The construction envelope has historically been affected by partial clearing and weed invasion from past land use activities (e.g. grazing) and is affected by ongoing feral animal activity, particularly pig activity. Vehicle tracks in the construction envelope have been subject to erosion and weed invasion due to recreational vehicle access, which has also resulted in localised damage to vegetation and threatened species habitat.

There is some potential for the project to disperse weeds into areas where they do not currently occur due to increased vehicle movements. However, this would be mitigated through the site hygiene and weed management proposed. Restricting site access would also reduce risks of weeds introduced and spread by recreational vehicles. The most likely causes of weed dispersal associated with the activity would include earthworks, movement of soil and attachment of seed (and other propagules) to vehicles and machinery.

Immediately adjacent to the areas of direct impact, some types of native vegetation may be affected by changes to microclimatic conditions such as sunlight levels, average windspeed and soil moisture availability. Given that affected vegetation consists primarily of dry sclerophyll forest and woodland, it is not likely to be substantially affected by such changes. Construction activities may also result in temporarily increased dust levels, covering adjacent vegetation and inhibiting growth.

These changes may result in minor degradation of native vegetation through weed invasion, changes to native plant species composition and diversity and habitat suitability for animal species.

ii Noise, vibration and artificial lighting disturbance to native animals in adjacent habitat

In addition to permanent edge-effects, there may be temporary impacts from noise, vibration and artificial lighting during the construction period. There may be potential for some impact from operational lighting immediately surrounding buildings, however with the proposed minimisation of lighting, the impact on adjacent wildlife would be minimal. Wildlife friendly lighting principles would be adopted wherever practicable in accordance with the *National Light Pollution Guidelines for Wildlife* (DCCEEW 2023b).

Possible effects of noise on native animals include permanent hearing impairment in the case of extremely loud noise, interference with communication between animals and disruption to normal activities such as foraging (Hoskin, CJ & Goosem, MW 2010).

Construction activities would result in increased levels of noise and vibration, particularly as a result of blasting activities during construction of the reservoirs walls, and as a result of general construction activities. While noise levels may be elevated both day and night, the highest noise generation would be during daylight hours (EMM, 2025b).

The impacts of noise and ground vibration on fauna is expected to be low, albeit based on limited literature on the topic EMM, 2025b. There are no current government policies or guidelines that recommend noise thresholds or criteria in relation to fauna. High noise levels may lead some species avoiding noisy areas. Radle (2007) states that typically terrestrial fauna will avoid any area where noise or vibration presents an annoyance to them. Additionally, many animals react to new noise initially as a potential threat but quickly learn that the noise is not associated with a threat (Radle, 2007).

The Australian Academy of Science provided a review of research into noise and the environment. The focus of the review for no-marine species was largely on continuous noise from urban environments including roads and industrial sites. The review confirmed that high noise levels can affect the calling of birds and communication, sometimes resulting in change in nesting areas, with noisy areas being repopulated by a more noise tolerant species of bird. However, the actual level of noise where this occurs is unclear. Studies have indicated high noise areas can affect the ability of frogs to communicate and breed.

In general, increased construction or operational activity levels are likely to result in reduced fauna activity around work areas and heavily trafficked road segments. Noise will be generated by the project through operation of machinery, plant, vehicles, and blasting. Fauna species that occur in the vicinity of construction sites and main traffic routes are expected to leave the immediate area of noise impact. It would be anticipated that following completion of the construction period, fauna could return to the previous habitat.

It is anticipated that construction noise would be clearly audible (i.e. 10-20 dB above RBL) within the national park at times during the main construction period however would not exceed the adopted criteria for passive recreation EMM, 2025b.

The greatest impacts would occur during construction works, with impacts during the operation of the project anticipated to be significantly less than those experienced during construction works. Lighting for night works also has the potential to result in light spill into adjacent habitat areas, and disturbance to fauna species during construction of the project.

Noise, vibration and artificial lighting may lead to some animals temporarily ceasing to utilise habitat adjacent to the disturbance footprint during the construction of the project or may impair their normal activities, but is unlikely to cause a significant impact on any species. Usage is predicted to return to pre-construction levels during operation due to minimal ongoing impacts.

iii Interruption of animal movement

Removal of native vegetation and associated habitat and inundation of land has the potential to fragment fauna habitat, with potential to restrict fauna species movement, reproduction and gene flow (Bennett, AF 1990) (Keller, I & Largiadèr, C 2003) (Dixo, M et al. 2009). Clearing can result in the inability of species to move between patches of suitable habitat or a reduced movement. Species most vulnerable to fragmentation include relatively sedentary species with low mobility. Species least vulnerable to barrier effects tend to be those that are highly mobile (e.g. birds), although even these species can vary in their response to fragmentation. Ultimately, fragmentation can increase the vulnerability of flora and fauna populations to stochastic events and extinction (Bennett, AF 1990) (Smith, J & Hellmann, J 2002) (Fischer B, & Lindenmayer, D 2007).

To the north-east of Farmers Creek, under present conditions, habitat connectivity is continuous as the construction envelope is surrounded by native forest and woodland. Construction of the project in this area would impede animal movement to some degree, requiring animals to move greater distances between areas of habitat. However, it would not permanently isolate any areas of habitat as connectivity forest / woodland connectivity would remain between all areas of retrained habitat. Birds, bats frogs and some reptiles are likely to be able to continue to cross the reservoir and other operational areas during operation but would be less likely to do so due to reduced cover and higher risk of predation.

Narrow (~10 m wide), linear areas of clearing would be required for geotechnical investigations in part of the construction envelope, creating an 'island' of retained habitat within the disturbance footprint. Due to the narrow width of the break in habitat created and the fact that these areas would be assisted to regenerate with native vegetation post-construction, this habitat would not become permanently isolated by the project.

Vegetation to the south-west of Farmers Creek is also well connected with relatively intact native vegetation around Lake Lyell to the south-west and further upstream along Farmers Creek and adjacent hills to the south-east. The project would reduce fauna habitat connectivity through this area by removing much of the habitat that connects these two areas. Some connectivity of woodland and forest would remain between these areas, via a corridor of remaining woodland and forest along the eastern boundary of the construction envelope and within adjacent lands.

Most remnant vegetation in the vicinity of Sir Thomas Mitchell Drive is already disturbed and moderately to highly fragmented though several areas with more intact native vegetation remaining to the north of the road reserve. The project would reduce direct connectivity between these areas but they would remain connected at a landscape scale by vegetation further to the north. Habitat connectivity in a north-south direction across Sir Thomas Mitchell Drive is poor with relatively broad (>50 m wide) areas of sparse vegetation separating patches of relatively intact native vegetation north and south of the road. The project is unlikely to significantly impact animal movement between habitats north and south of the road. The upgrade of Sir Thomas Mitchell Drive would result in increases in the distance between patches of animal habitat through the removal of trees but given that clearing in these areas would consist of narrow strips of land, along an existing road in an already fragmented local landscape, it is considered unlikely to significantly modify the ability of threatened species to move through the landscape between areas of habitat.

The likely impact of interruption of movement on threatened species is discussed further in Section 8.2.2.

iv Vehicle strike and powerline collision impacts on animal populations

a Vehicle strike impacts

There will be increased vehicle traffic on publicly accessible roads within and adjacent to the construction envelope during the construction phase (EMM 2025c). This will include a peak of up to 1,144 daily vehicle movements associated with the main construction works area and 604 daily vehicle movements associated with the accommodation camp.

New and existing access tracks in the disturbance footprint will be upgraded with new roads created. Unmitigated, this has the potential to result in increased mortality of animals due to vehicle strike in these areas. Rare or low-density populations are most at risk of significant impacts if this impact is not managed appropriately (Hoskin, CJ & Goosem, MW 2010). Despite some level of impact being possible, most impacts should be limited to common or abundant species.

The potential for increased traffic during construction to result in increased mortality of native animals would be minimised by the construction traffic driving rules in high-risk sections of road, and at night when most native animal species are active.

Operational road traffic would consist of 1 to 2 light vehicles and a light truck, conducting routine maintenance around the site. These traffic volumes are expected to be less than 2% of the existing road traffic (EMM 2025b). As such, adverse vehicle strike impacts from operational road traffic are considered unlikely to be significant and have not been assessed further.

The likely impact of vehicle strikes on threatened species is discussed further in Section 8.2.4.

b Power infrastructure impacts

The project does not include any new power transmission lines but will require construction of some additional electrical infrastructure to power project elements and enable connection with existing power transmission lines.

Overhead powerlines may be hazardous for medium to large species of birds, flying-foxes and arboreal mammals. If an animal simultaneously contacts two electrical wires (conductors or phases) or a single-phase and a ground wire, it may be electrocuted. Birds may also be injured through collision with conductors.

Indirect impacts, such as mortality of individuals due to interaction with power infrastructure, could impact the following threatened species recorded or likely to occur intermittently within the construction envelope:

- Grey-headed Flying-fox
- Little Eagle
- Powerful Owl
- Square-tailed kite
- White-bellied Sea-Eagle.

Minimising collision and electrocution hazards to animals will be considered in the detailed design of electrical infrastructure to reduce risks to birds, bats and arboreal animals.

With the proposed design mitigation, it is anticipated that the new power infrastructure is unlikely to result in a significant increased hazard to local wildlife or to significantly affect the populations of any animal species.

v Impacts on water quality during construction

Construction activities have the potential to result in impacts to water quality in watercourses located downstream of construction area in the following ways:

- Release of poor-quality water to watercourses. In particular, any sediment laden water that could arise following mobilisation of soils / sediments during inclement weather over disturbed soils and sediments in areas where vegetation has been cleared and/or soil and construction material has been stockpiled. If untreated surface water was released to watercourses it could be detrimental to aquatic habitat and biota.
- Reduction in watercourse bank stability following any nearby construction and any clearing of riparian vegetation could also result in bank erosion and input of sediments into watercourses.
- Accidental release of chemicals and fuels (e.g. oils, hydraulic fluids and fuel from construction equipment) could result in the input of hydrocarbon and metal contaminants into watercourses. The accidental release into watercourses of any pesticides, herbicides and sewage could also affect aquatic biota.
- Disturbance of riparian vegetation could have indirect impacts on aquatic habitat quality and influence abundance, distribution and health of aquatic biota.

The likely impact of alteration of flow regimes and associated impacts on water quality is discussed further in Section 8.2.3.

vi Indirect impacts to Marrangaroo National Park

The southern boundary of Marrangaroo National Park is located approximately 20 m from the north-west boundary of the construction envelope. The area of the construction envelope adjacent to the national park has historically been affected by partial clearing for vehicle tracks and weed invasion from land use activities such as grazing and off-road-driving and is affected by ongoing feral animal activity, particularly pig activity. Vehicle tracks in and adjacent to the national park have been subject to erosion and weed invasion due to recreational vehicle access, which has also resulted in localised damage to vegetation and threatened species habitat.

The boundary of the construction envelope in this area follows the route of an existing fire trail and is located almost entirely on the top or opposite side of a ridgeline, or downslope of the National park boundary. The topography in this location minimises the potential for the project to result in surface water runoff into the national park. However, without adequate mitigation, there could be potential for the project to result in some stormwater runoff and associated sediment entering the national park.

There is some potential for the project to disperse weeds into areas where they do not currently occur due to increased vehicle movements. However, this would be mitigated through the site hygiene and weed management proposed, which would also address the existing risks associated with recreational vehicles.

Immediately adjacent to the areas of direct impact, native vegetation may be affected by changes to microclimatic conditions such as sunlight levels, average windspeed and soil moisture availability. Given that affected vegetation consists primarily of dry sclerophyll forest and woodland, it is not likely to be substantially affected by such changes in conditions associated with clearing. Construction activities may also result in temporarily increased dust levels, potentially covering adjacent vegetation and inhibiting growth.

Parts of the project would require wastewater services and asset protection zones; however, these elements would not be located close to the national park or within its catchment. The wastewater services and asset protection zones associated with the project are downslope within the construction envelope and would not impact the National park.

No access would be permitted through the national park during construction or operation of the project, other than in the event of an emergency. As the internal access roads would be secure and not publicly accessible, no additional unauthorised access to the national park would result from the project.

Noise, vibration and artificial lighting may lead to some animals temporarily ceasing to utilise habitat within areas of the national park adjacent to the disturbance footprint during the construction of the project or may impair their normal activities, but is unlikely to cause a significant impact on any species. Usage is predicted to return to pre-construction levels during operation due to minimal ongoing impacts.

A GDE assessment prepared by EMM (Appendix G of the EIS) found there are no obligate GDEs known or likely to occur within the area of potential groundwater impact. Terrestrial GDEs with a facultative and opportunistic dependence on groundwater, predominantly depend on rainfall infiltration and adjacent surface watercourses to meet their water requirements, accessing groundwater opportunistically and seasonally when the water table is sufficiently close to the rooting depth of deep-rooted perennial plant species. No significant drawdown is predicted within possible facultative / opportunistic GDEs in the national park. Further details of the GDE assessment are provided in Section 7.

No other indirect impacts on biodiversity values of Marrangaroo National Park, as discussed in the ‘Developments adjacent to National Parks and Wildlife Service lands’ guideline (DPIE, 2020), are likely to occur due to the project.

8.2 Prescribed impacts

Consideration has been given to prescribed impacts on threatened species and communities recorded or assumed to be present within the disturbance footprint, as per Chapter 6 of the BAM (DPIE 2020a). The prescribed impacts relevant to the project are documented in Table 8.2, and prescribed impacts are assessed in Section 8.2.1 to Section 8.2.4.

Table 8.2 Prescribed biodiversity impacts relevant to the project

Prescribed impacts	Relevance to the project
Karst, caves, crevices, cliffs, rocks and other geological features of significance.	No karst (eroded limestone landscape) features are found in the disturbance footprint. No quartz sandstone geology, typical of the cliffs and gorges of the nearby Blue Mountains area, is found in the construction envelope. The predominantly metasedimentary (quartzite) and fine-grained sedimentary (mudstone) geology of the majority of the site is not typically associated with substantial cave formation. The only large outcroppings of rock are found in the vicinity of Mount Walker, located 50 to 100 m north of the site. These areas contain large crevices and small cavities but do not appear to contain any caves. Rocky areas in the Mt Walker area contain only very small cliffs, around 5 to 15 m high, without any overhangs or protected areas suitable for larger animals to shelter. Assessed in Table 8.3.
Human-made structures.	The project does not include the removal of human made structures such as buildings or mine-shafts. Therefore, this prescribed impact is not relevant to the project.
Non-native vegetation.	Non-native vegetation is found in several locations in the disturbance footprint, largely associated with grazing land. None of the threatened species likely to occupy the disturbance footprint are likely to be reliant on non-native vegetation for roosting, breeding or frequent foraging. The loss of this habitat would have a negligible impact on threatened species.
Impacts on areas connecting threatened species habitat, such as movement corridors.	The project will impact on the connectivity of habitat within the construction envelope due to removal of vegetation and inundation of land. Assessed in Table 8.4.
Impacts that affect water quality, water bodies and hydrological processes that sustain threatened entities (including from subsidence or upsidence from underground mining).	The construction and operation of the project will result in changes to the hydrological regime of the existing Lake Lyell reservoir. Assessed in Section 8.2.3.
Impacts on threatened and protected animals from turbine strikes from a wind farm.	Not relevant to the project as it is not a wind farm.
Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC	The project will upgrade Sir Thomas Mitchell Drive and create internal site roads, widening tracks and temporarily increase local traffic movements. Several threatened species have been identified within the construction envelope that are likely to be susceptible to impacts from vehicle strikes. Assessed in Table 8.6.

8.2.1 Impact on habitat associated with karst, caves, crevices, cliffs, rocks and other geological features of significance

Impacts on habitat associated with crevices, cliffs and rocks on threatened entities are assessed in Table 8.3. The relevant threatened entities were generated from the candidate species and predicted species lists associated with karsts, caves, crevices, cliffs, rocks and other geological features of significance.

Table 8.3 Impact on habitats of threatened species or ecological communities associated with karst, caves, crevices, cliffs, rocks and other geological features of significance

Associated features of the disturbance footprint	Nature and extent of impact	Duration and timing of impact	Frequency of impact	Relevant threatened entities	Consequences of impacts on threatened entities	Limitations to data, assumptions and predictions about impacts
No karst (eroded limestone landscape) features are found in the disturbance footprint. No quartz sandstone geology, typical of the cliffs and gorges of the nearby Blue Mountains area, is found on in the construction envelope. The predominantly metasedimentary (quartzite) and fine-grained sedimentary (mudstone) geology of the majority of the site is not typically associated with substantial cave formation. The only large outcroppings of rock are found in the vicinity of Mount Walker, located 50 to 100 m north of the site. These areas contain large crevices and small cavities but do not appear to contain any caves. Rocky areas in the Mount Walker area contain only very small cliffs, around 5 to 15 m high, without any overhangs or protected areas suitable for larger animals to shelter.	Possible temporary decrease in the availability of rocky habitat adjacent to the construction envelope due to noise and vibration associated with earthworks deterring occupation by sensitive animal species.	Temporary, short-term (construction phase)	Once	Large Bent-winged Bat (R, D)	Large Bent-winged Bats require deep caves with very specific and stable humidity and temperature conditions for breeding (Dwyer, P D & Hamilton-Smith, E 1965). They are unlikely to breed in the small crevices and cavities in the rocky habitat adjacent to the construction envelope but they may roost there during non-breeding periods. The project will not cause permanent reduction in the availability of potential roosting habitat that may be intermittently used by the species for roosting This habitat may become temporarily unsuitable as roosting habitat during construction, due to noise and vibration impacts. But this habitat should become available again to the species post construction since the operational phase noise and vibration levels in the habitat are unlikely to differ significantly from pre-construction levels. This habitat is not considered limiting in the locality due to species being known to utilise a wide variety of habitat for roosting. The project's impact on these features is unlikely to substantially affect the local population of the species.	Utilisation of the habitat for roosting/shelter by the species is assumed. It is assumed that the disturbance associated with earthworks will deter the species from using the habitat although the disturbance thresholds for the species are unknown.

Notes: R = Recorded in the disturbance footprint
D = Dual credit (ecosystem-credit and species-credit) species
S = Species-credit species
ES = Ecosystem credit species

8.2.2 Impact on areas connecting threatened species habitat such as movement corridors

Impacts on areas connecting threatened species habitat such as movement corridors are assessed in Table 8.4. The relevant threatened entities were generated by looking at the candidate species list that are susceptible to habitat fragmentation and isolation. (AS 2009) (DPIE 2020a).

Table 8.4 Impacts on areas connecting threatened species habitat such as movement corridors

Associated features of the disturbance footprint	Nature, extent and duration of impact	Duration and timing of impact	Frequency of impact	Relevant threatened entities	Consequences of impacts on threatened entities	Limitations to data, assumptions and predictions about impacts
Upper reservoir and other areas north of Farmers Creek	The construction of the reservoir and associated infrastructure and access roads will involve removal of native vegetation. Habitats will however remain directly connected via large areas of continuous forest and woodland encircling the impact areas. Areas of the impact footprint not required during the operation of the project (e.g. geotechnical investigation areas and associated tracks) will be rehabilitated following construction, reducing impacts to connectivity in the longer term.	Permanent, long-term (construction and operation phase)	Once	**Arboreal mammals**: • Koala (R, S) **Terrestrial mammals** • Spotted-tailed Quoll (ES) **Microbats**: • Large Bent-winged Bat (R, D) • Eastern Coastal Free-tailed Bat (R, ES) • Southern Myotis (R, S). **Birds:** • Glossy Black Cockatoo (R, D) • Gang-gang Cockatoo (R, D) • White-bellied Sea-eagle (R, D) • Little Eagle (D) • Powerful Owl (R, D) • Sooty Owl (R, D) • Square-tailed Kite (D) • Scarlet Robin (R, ES) • Varied Sitella (R, ES) • Dusky Woodswallow (R, ES) **Insects:** Purple Copper Butterfly (A, S).	Under present conditions, these threatened animals may move between the extensive areas of habitat across the construction envelope. During the operation of the project, the threatened arboreal and terrestrial mammals present in the disturbance footprint for the new upper reservoir and associated infrastructure will no longer be able to easily cross these areas due to the associated clearing of vegetation and expanse of open water. Threatened small woodland and forest birds, owls and microbats are likely to continue to cross during operation but may be less likely to do so due to reduced cover and higher risk of predation. The movement of raptors is unlikely to be substantially affected. The narrow bands of clearing required for the geotechnical investigations and associated access roads (up to 20 m but typically around 10 m) are unlikely to interfere with animal movement since these relevant threatened species are capable of traversing narrow tracts of cleared land between forested areas. These and some other areas impacted during the construction phase will be rehabilitated on completion of the works and animal movements through these areas would slowly return. The upgrade of Sir Thomas Mitchell Drive would result in increases in the distance between patches of animal habitat through the removal of trees but given that clearing in these areas would consist of narrow strips of land, along an existing road in an already fragmented local landscape, it is considered unlikely to significant modify the ability of threatened species to move through the landscape between areas of habitat. The project is unlikely, however, to prevent long-term movement of any threatened species of animals from one side of the project footprint to the other as habitat would remain directly connected in areas of continuous forest and woodland. Some connectivity of woodland would also remain in the more degraded areas around Sir Thomas Mitchell Drive.	Movement habitat requirements of species are not well understood.
Access Road	The project will involve removal of native vegetation and trimming of trees along part (~ 3 km) of an existing road (Sir Thomas Mitchell Drive). These impacts will be permanent as roads will be maintained during operation.					

Notes: R = Recorded in the disturbance footprint.

D = Dual credit (ecosystem-credit and species-credit) species.

S = Species-credit species

ES = Ecosystem credit species

A = Assumed presence.

8.2.3 Impact on water quality, water bodies and hydrological processes that sustain threatened species

Potential impacts on terrestrial biodiversity due changes to water quality, water bodies and hydrological processes are discussed below in relation to the near-natural areas of Farmers Creek and Coxs River, and the Lake Lyell reservoir. Other steams in the construction envelope are small and ephemeral, and are unlikely to sustain any threatened species.

a Near-natural areas of Farmers Creek and Coxs River

Areas of Farmers Creek upstream of the construction envelope and Coxs River upstream of Lake Lyell are in near-natural condition, in that they are surrounded by native vegetation, are perennial flowing and not inundated for extended periods. These upstream extents of Farmers Creek are of considerably high water quality condition (as evidenced in the Aquatic Ecology Assessment) and therefore likely to support a wide range of semi-aquatic birds, turtles, frogs and mammals, particularly those that are reliant on flowing, high quality water and riparian vegetation. However, as the disturbance footprint does not coincide with any of these near-natural areas, they are unlikely to be significantly affected by the project. That is, at its nearest point, the disturbance footprint is located approximately 50 metres from the near-natural section of Farmers Creek, near its confluence with Lake Lyell. Beyond this point, the disturbance footprint diverges from Farmers Creek and is located at least 100 m from the stream. The disturbance footprint is separated from the near-natural section of Farmers Creek by a ridgeline and any potential surface water impact is only likely to occur downstream, in an area that is already affected by the artificial inundation and regulation of the lake. The near-natural areas of Coxs River are distant from the construction envelope and are unlikely to be significantly affected by the project.

If unmitigated, the project could have adverse impacts on the lowest extents of the near-natural areas of Farmers Creek, near its confluence with Lake Lyell. However, if the measures proposed to manage sedimentation and water quality are effectively applied, it is unlikely that the project would have an impact on near-natural areas of Farmers Creek.

b Lake Lyell reservoir

Lake Lyell is an artificially inundated and flow-regulated water body. The water body and edges of Lake Lyell provide potential foraging habitat and cover for a variety of native species of waterbirds, reptiles and mammals. Within the project footprint, shallow water and exposed muddy habitat, of a type typically utilised by wading birds, is generally absent from the steep margins of the water body, limiting its potential as habitat for threatened and/or migratory wading birds. Such habitat is also scarce around the fringes of Lake Lyell during typical conditions. Latham's Snipe (*Gallinago hardwickii*), which is listed as Vulnerable under the EPBC Act and BC Act and Migratory under the EPBC Act, was recorded at Lake Lyell in 2018. The Blue-billed Duck (*Oxyura australis*) which is listed as Vulnerable under the BC Act, was recorded at Lake Lyell in 2014. White-bellied Sea-Eagles (*Haliaeetus leucogaster*), listed as Vulnerable under the BC Act, have been recorded at Lake Lyell in 2023 and 2024.

The only other threatened species listed under the BC Act and/or EPBC Act that are considered to have potential to utilise the waterbody and edges of Lake Lyell are Sharp-tailed Sandpiper (*Calidris acuminata*) and Freckled Duck (*Stictonetta naevosa*). However, habitat for these species is marginal due to the paucity of exposed mudflats or emergent aquatic vegetation.

With the operation of the project, Lake Lyell will be maintained with a maximum level (784.5 mAHD) approximately 1 m below the existing FSL of 785.5 mAHD. This would result in a reduction in the frequency of inundation in some areas that are currently inundated when the reservoir is at FSL. Lake Lyell water levels will fluctuate during each daily generation cycle, dropping between 2.1 and 2.5m below the maximum level operating (784.5 mAHD) when pumping, depending on starting level, over a 6-to-8-hour period. When generating the reverse sequence applies with the lake rising between 2.1 and 2.5 m to a level of less than or equal to RL 784.5 m, depending on starting level.

Lake Lyell is currently operated to supply water to the Mt Piper power station and there are existing operational guidelines that include impacts to aquatic ecology values within Lake Lyell as a result of fluctuating water levels. The construction of the PHES will alter the frequency of changes in water level within the existing operation guidelines of Lake Lyell. Indirect impacts to terrestrial and semi-aquatic biodiversity from the operation of the PHES associated with diurnal fluctuations in water level in Lake Lyell have not been considered as similar impacts already occur within the existing operational guidelines for Lake Lyell. As such, additional impact as a result of fluctuating water levels are expected to be minimal.

The project has potential to change water quality within Lake Lyell, which may impact some fauna species that use this waterbody. However, with appropriate mitigation of water quality during construction and operation, it is considered that the project will likely have negligible impacts or even positive impact on water quality in time. That is, the aquatic environment within Lake Lyell is already considered substantially degraded, as indicated by elevated concentrations of 13 out of 18 metals in sediments of Lake Lyell beyond water quality guidelines (see Aquatic Ecology Assessment, Austral Research and Consulting 2025). Farmers Creek and Coxs River also had depauperate invertebrate taxa abundance and diversity, providing further evidence of disturbance and pollution within the Lake Lyell catchment. It is not expected that the project will further degrade water quality in time, apart from some mobilisation of suspended solids and sediment concentrations during wet weather through construction and initial discharge to Farmers Creek arm of Lake Lyell, but this should settle in time (see Surface Water Assessment, EMM 2025d).

However, through operation of the project, it is expected that the water cycling by the project will reduce stratification and improve water quality in the Farmers Creek arm and upper reaches of the lake (see Surface Water Assessment), which is likely to increase habitat quality for aquatic flora and fauna in Lake Lyell, whilst indirectly support other wildlife (e.g. increased prey resources for waterbirds). Further, water temperatures are not expected to change from operating the project. Lastly, downstream impacts to biodiversity values are considered negligible as there will be no change in environmental flows due to the project, whilst construction, commissioning and operational phase of the project are expected to have a neutral to beneficial effect on water quality in the Coxs River downstream of Lake Lyell (see Surface Water Assessment).

In the absence of mitigation, the changes to the aquatic ecosystem of Lake Lyell could result in a reduction in food availability and shelter for some waterbird species if it results in the loss of submerged aquatic vegetation. Submerged aquatic vegetation may be impacted by any decreased light availability due to increased turbidity or algal blooms or may be smothered by silt. Exposure of currently submerged vegetation during pumping cycles may cause this vegetation to die. However, this may be offset to some degree by increased light penetration to deeper areas of the lake at these times, resulting in the development of new areas of submerged aquatic vegetation.

The intermittent inundation and exposure of shallower areas around the lake margin is also likely to increase the suitability of this habitat for wading birds, creating environments similar to those of tidal mudflats. At the lake edges, the altered regime may also be more conducive to the development of emergent aquatic plants, such as Narrow-leaved Cumbungi (*Typha domingensis*) and Common Reed (*Phragmites australis*), due to more frequent availability of oxygen to their root systems. An increase in emergent aquatic plants would increase habitat suitability for waterbirds such as the Blue-billed Duck and Freckled Duck.

Unmitigated, the project could have adverse impacts on waterbirds and White-bellied Sea-Eagles. However, with the measures proposed to manage sedimentation and water quality, it unlikely that the project would have a substantial negative impact on biodiversity associated with the water body of Lake Lyell. It is possible that the altered hydrological regime will increase habitat suitability (i.e. resource availability and extent) for these species.

The potential impact on water quality, water bodies and hydrological processes that sustain threatened species for Lake Lyell and Farmers Creek are detailed in Table 8.5. Note that as the construction and operation of the PHES facility will have a neutral to beneficial effect on the water quality in the Coxs River downstream of Lake Lyell, consideration of potential impacts on Coxs River on threatened species are not considered required. Further details are presented in the Aquatic Ecology Assessment (Austral Research and Consulting, 2025) and Surface Water Assessment (EMM, 2025d).

Table 8.5 Impact on water quality, water bodies and hydrological processes that sustain threatened species

Potential surface water impacts	Nature and extent of impact	Duration and timing of impact	Frequency of impact	Relevant threatened entities	Consequences of impacts on threatened entities	Limitations to data, assumptions and predictions about impacts
Lake water level regime	The lake FSL will be lowered by approximately 3.2 m during construction. No changes to the existing lake operating approach or environmental releases are proposed.	Construction phase	Ongoing	Threatened and migratory waterbirds; White-bellied Sea Eagle; Southern Myotis.	Short term impacts in habitat quality and extent for relevant threatened species may result from a reduction in macrophyte cover. That is, lowering of water levels lead to the loss of submerged aquatic vegetation.	• Importance of habitat within Lake Lyell for these relevant species is uncertain. • Predicted response of macrophyte cover and prey to change in hydrological regime and water quality in Lake Lyell and Farmers Creek arm associated with the project are not tested.
	Lake Lyell will continue to be maintained in a near full condition, the water level regime will change from moving slowly to fluctuating daily due to the PHES operation. The maximum rate of water level change will be 0.4 m/hr and the maximum change in water level over a full cycle will be 2.75 m. There will be no change to lake flood levels.	Operation phase	Daily		Habitat quality and extent for relevant threatened species should improve as macrophytes recolonise with stabilisation of the water regime with ongoing operation of the project. It is possible that daily oscillation of water improves the foraging opportunities for these species, as in the sense of tidal movements in estuaries that usually favour at least migratory waterbirds, such as through providing increased opportunities for foraging during lower water levels.	
Lake inflows/streamflow regime	No material changes to lake inflow regimes are expected during construction and operation.	Construction and operation phase	Ongoing		No expected impact on threatened species.	
Maximum flows in Farmers Creek arm	No material changes to the streamflow regime or water quality in the Farmers Creek during construction or operation.	Construction and Operation phase	Ongoing		No expected impact on threatened species.	
Water quality of inflows	Sediment discharged to downstream Farmers Creek or Lake Lyell during construction activity. No changes to the water quality of inflows expected during construction.	Construction phase	Wet weather		If mitigation is ineffective, poor water quality may result due to discharges associated with natural rainfall events. Poorer water quality may reduce the habitat condition and resource availability for associated threatened species.	
Lake stratification cycle	No changes to the lake stratification cycle will occur during construction. The operation of the PHES facility will beneficially reduce the extent and magnitude of lake stratification due to pumping and discharging water from upper reservoir into Lake Lyell.	Operation phase	Ongoing		Prey availability (e.g. fish and macroinvertebrates) for relevant threatened species likely to increase with operation due to increased dissolved oxygen levels.	
Algae levels within Lake Lyell	No changes to the extent and magnitude of algae levels in Lake Lyell are expected during construction. The operation of the PHES facility will beneficially reduce the extent and magnitude of algae blooms in Lake Lyell.	Operation phase	Ongoing		Prey availability (e.g. fish and macroinvertebrates) for relevant threatened species likely to increase with operation due to lower occurrence of algal blooms.	
Water quality of lake water	Potential for increased suspended sediment concentrations and turbidity levels in the Farmers Creek arm of Lake Lyell during wet weather due to sedimentation basin overflows, no other material changes to water quality are expected in the Farmers Creek arm or other parts of the lake.	Construction phase	Wet weather		Given the poor water that commonly occur in Lake Lyell (e.g. elevated nutrients and intermittent elevated turbidity after wet weather), it is considered unlikely that any temporary increase in turbidity and suspended solids during construction and operation would impact relevant threatened species.	
	Scour in Farmers Creek arm may occur during the initial operating period. Scour has potential to generate suspended sediment and turbidity in Farmers Creek arm and the adjoining areas of Lake Lyell. The extent and magnitude of any impacts would decline overtime as the scour and depositional processes reach a new equilibrium.	Operation phase	Until scour and depositional processes reach a new equilibrium			

8.2.4 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

Impacts on vehicle strikes on threatened species of animals or on animals that are part of a TEC are assessed in Table 8.6. The relevant threatened entities were generated from the candidate species and predicted species that are susceptible to vehicle strike.

Table 8.6 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

Associated features of the disturbance footprint	Nature, extent and duration of impact	Relevant threatened entities	Consequences of impacts on threatened entities
Newly created internal roads. Public roads (Sir Thomas Mitchell Drive and Magpie Hollow Road).	Increased incidence of vehicle strikes on publicly accessible roads during construction due to increased traffic. New potential impacts of vehicles strikes on newly created internal roads with the greater risk during construction due to increased traffic.	All fauna species.	There will be increased vehicle traffic on publicly accessible roads within and adjacent to the construction envelope during the construction phase. Unmitigated, this has the potential to increase mortality of animals due to vehicle strike in these areas. Rare or low-density populations are most at risk of significant impacts if this impact is not managed appropriately (Hoskin, CJ & Goosem, MW 2010). Despite some level of impact being possible, the majority of impacts will be limited to common or abundant species. The potential for increased traffic during construction to result in increased mortality of native animals would be minimised by the construction traffic driving rules in high-risk sections of road and at night when most native animal species are active.

8.3 Avoidance, minimisation and management

The hierarchy of avoid, minimise and mitigate has been used in the design of the project, fine-tuning of the proposed investigation locations, and development of mitigation measures.

A key focus of project design has been to avoid and minimise impacts to biodiversity values identified during the field surveys where feasible. The project has undergone significant steps to avoid, minimise and mitigate impacts. The process below has been followed to ensure impacts are avoided and minimised to the greatest extent possible, within the design and other limitations of the project, through:

- identification of biodiversity values through comprehensive, rigorous and thorough biodiversity surveys
- communication of identified values to the project team
- consultation between the design team and project ecologists on various elements to consider both direct and indirect impacts and work through an iterative design process, with multiple iterations of design elements to achieve best practice outcomes
- feedback of consultation into the design process
- finalisation of measures to avoid, minimise and mitigate impacts.

Measures undertaken to avoid, minimise and mitigate impacts that have arisen during the process outlined above are summarised below.

8.3.1 Avoidance in site selection

Clearing of large extents of native vegetation and associated habitat has been substantially avoided through siting the project in an area where existing infrastructure can be utilised by the project. Reducing the construction footprint by utilising existing infrastructure will also reduce potential indirect (e.g. noise, light and dust) and prescribed (e.g. vehicle strike) impacts associated with construction. Specifically, the project will avoid impacts through using the following existing infrastructure:

- Use of an existing lower reservoir, avoiding the need for extensive clearing of native vegetation and associated habitat to construct a lower reservoir.
- Use of an existing water supply within the existing lower reservoir, avoiding the need for extensive clearing of native vegetation and associated habitat to construct a water supply pipeline (and any impacts of draining a waterway where this water is sourced).
- Use of an existing access road (i.e. Sir Thomas Mitchell Drive), avoiding the need for clearing of native vegetation and habitat, as well as the prescribed impact of vehicle strike for fauna, associated with the construction of a new access road.
- Use of an existing power transmission line, avoiding the need for clearing of native vegetation and habitat, and associated prescribed impacts of increasing electrocution and collision risk, associated with constructing a new transmission line.

8.3.2 Avoidance in design

i Design integration and assessment approach

A design integration and assessment (DIAA) process (as described in Appendix B of the EIS) was undertaken to develop the design and construction methods presented in the EIS, with the guiding principles of avoiding and minimising environmental impacts where possible and engaging with key stakeholders throughout the process.

The DIAA involved identifying potential environmental impacts of an initial design, and then iterating aspects of that design to avoid and minimise the identified potential impacts where possible. This process is repeated to ensure a balanced assessment is completed, and that all reasonable and feasible changes to the design have been completed to ensure the preferred project demonstrates the best possible environmental and social outcome.

Key biodiversity constraints identified early on in project design which guided the project design to avoid/minimise impacts include:

- Marrangaroo National Park – project will avoid direct impacts and minimise indirect impacts by siting the construction envelope at least 20 m away from the boundary of this National park
- Farmers Creek – project will avoid impacts to the natural system of Farmers Creek by diverting this creek at near the junction with Lake Lyell, rather than higher up in the catchment.

As part of the EIS studies, further key constraints were identified such as breeding and foraging habitat for threatened bird species. It was recommended that where possible, the development avoid and/or minimise impacts.

ii Avoidance and minimisation measures adopted

Avoidance and minimisation measures adopted which have reduced potential impacts to biodiversity include:

- construction haul roads and permanent access roads were aligned where possible within the same disturbance footprint to minimise overall clearing of native vegetation and habitat
- bridges will be built over Farmers Creek to allow vehicle / equipment access whilst avoiding potential direct and indirect (e.g. water quality) impacts to this waterway
- powerhouse and waterways (e.g. pipelines transporting water from upper reservoir to Lake Lyell) located underground to minimise impacts on flora and fauna as well as indirect impacts associated with construction and operation (e.g. noise and visual impacts)
- switchyard area used for construction laydown area was located partially within areas of exotic vegetation and open water and located immediately adjacent to the existing power transmission line, minimising impacts on intact native vegetation and habitat
- the upper reservoir was designed to be a rockfill embankment dam within a gully, which utilises a cut fill balance as far as possible to maximise reuse and minimise the need for disposal or transport of material off site. This approach potentially avoids impacts to biodiversity values associated with winning additional material, or disposal of extracted material
- reuse of extracted material was considered throughout the design, including using won material for the protection of the inlet/outlet structure and excavated rocks for concrete aggregates. This approach potentially avoids impacts to biodiversity values associated with winning additional material, or disposal of extracted material

- the accommodation camp site was located to be constructed in an area where native vegetation has been almost entirely cleared and contains poor condition derived native grassland and exotic grassland.

iii Ongoing design development

The principles to avoid and minimise impacts will continue to inform the refinement and optimisation of the project during detailed design.

8.3.3 Minimisation and mitigation

All works will be undertaken in accordance with general mitigation measures to be identified in the construction environment management plan (CEMP). Prior to construction, a biodiversity management plan (BMP), forming part of the CEMP, would be prepared that would include the construction management measures proposed.

Details of impact minimisation and mitigation measures will be provided in the BMP, including:

- techniques, timing, frequency and responsibility for the implementation of measures
- identification of the risk of failure of measures
- monitoring requirements to determine the efficacy of measures
- triggers and responses for adaptive management.

Key minimisation and mitigation measures include:

- retention of vegetation and habitat
- minimising injury of native animals during clearing and construction
- adoption of wildlife friendly lighting principles in accordance with the National Light Pollution Guidelines for Wildlife (DCCEEW 2023b).
- weed control
- native vegetation restoration.

These measures are described below.

i Retention of vegetation and habitat

Site preparation works will require clearing of native vegetation and habitat for native animals. These works have the potential to cause inadvertent impacts on retained vegetation and habitat in the absence of appropriate controls. To minimise impacts on vegetation and prevent inadvertent impacts on retained vegetation and habitat the following controls will be implemented:

- Native vegetation and fauna habitat will be retained, wherever possible, with clearing minimised to the extent required to construct and operate the project.
- The removal of large trees (>0.5 m DBH) would be avoided, wherever practicable, by designing the precise location of temporary access tracks with consideration of the 'structural root zone' of trees as described in the relevant Standards Australia, Protection of trees on development sites, Standards Australia, Sydney (AS2009). The precise locations of the trunks of large trees to be removed and retained would be identified by land survey and included on design plans to facilitate avoidance.

- Exclusion zones around all areas of retained vegetation and fauna habitat will be set up where practicable. These areas will be fenced using appropriate fencing materials and designated and signed as 'No-go Zones' or 'Environmentally Sensitive Areas'.
- When accessing construction sites, contractors would use only designated routes on existing tracks or through non-native vegetation.
- No materials, spoil or machinery would be stored or parked within the drip-line of any trees to be retained.

ii Minimising injury of native animals

The potential for increased traffic during construction to increase mortality of native animals should be minimised by the implementation of construction traffic driving rules, including:

- 50 km/h speed limit for Sir Thomas Mitchell Drive and Magpie Hollow Road during daylight hours
- 40 km/h speed limit for Sir Thomas Mitchell Drive and Magpie Hollow Road between sunset and sunrise
- minimisation of construction traffic between sunset and sunrise
- monitoring of roadkill during construction
- development trigger levels for roadkill frequency and implementation of management measures (e.g. further reduction in speed limits and/or temporary fencing,) if trigger levels are exceeded.

Power infrastructure, buildings and fences to be constructed as part of the project could create collision, electrocution or engagement hazards for native animals, particularly birds, bats and gliding possums. The potential for these hazards should be minimised through detailed design, including:

- designing power infrastructure to minimise electrocution risk, e.g. inclusion of bird guards and conductor insulation to provide a mechanical barrier between the high-voltage power source and the outside environment. Consideration would be given to the following guideline: *Protecting birds on powerlines: a practical guide on the risks to birds from electricity transmission facilities and how to minimise any such adverse effects* (Haas et. al 2003)
- inclusion of animal climbing guards on power poles to reduce the likelihood of animals successfully climbing poles and contacting high-voltage terminals
- inclusion of wildlife friendly fencing design principles in the design of site security fencing to ensure that it does not entangle or harm wildlife, allows the safe movement of wildlife between areas of habitat, and prevents wildlife access to potential hazards
- permanent fencing should be designed to allow the safe movement of wildlife between areas of habitat outside of the disturbance footprint and habitat in non-operational areas to be rehabilitated, e.g. inclusion of crossing structures to enable animals to move over, through or under fences
- all fences for the project (temporary and permanent) should only use barbed wire if its legally mandated (e.g. around electrical infrastructure for public safety reasons). Barbed wire is particularly hazardous to birds, bats and gliding possums (van der Ree 1999)

- collision risks associated with buildings in the construction envelope would be minimised through by adhering to the following design principles: minimising the use of glass, increasing the visibility of glass through patterning, minimising reflection of vegetation and the sky by glass panes, and avoiding the creation of perceived fly-through conditions for birds. Consideration would be given to the following guideline during design: *Reducing Bird Collisions with Buildings and Building Glass Best practices* (USFWS 2021).

Clearing of native vegetation and fauna habitat has potential to harm native fauna species. To minimise inadvertent injury of animals prior to and during vegetation clearing, pre-clearance surveys and clearing supervision will be undertaken by appropriately qualified ecologists.

Pre-clearing and vegetation clearing works are to follow a two-phase process, as outlined below:

- Pre-clearance (Phase 1) surveys will be undertaken to:
    - contact a wildlife carer or veterinarian to seek their assistance with scheduled vegetation clearing works
    - identify and mark features such as dead and/or hollow-bearing trees and fallen hollow logs that should be avoided during Phase 1 clearing
    - search for and, capture and later relocate reptiles under any loose or lightly embedded surface rocks and small logs
    - search for signs of current utilisation of the location by Koalas; if a Koala is sighted, clearing would not be undertaken within 30 m of the location until the Koala moves away.
- Phase 1 clearing will include the removal of all vegetation that is unlikely to contain sheltering and/or nesting sites for hollow-dependent fauna (e.g. shrubs and hollow-free trees). Phase 1 clearing may be undertaken immediately after pre-clearance (Phase 1) surveys. A minimum of 24 hours is required between Phase 1 and Phase 2 clearing.
- Clearing supervision (Phase 1) will include:
    - inspection of areas planned for Phase 1 clearing on a daily basis to detect any animals that may be present, particularly Koalas in any unmarked trees; clearing would be avoided within 30 m of the location until the Koala moves away
    - capture and relocate any animals encountered by clearing crews during clearing works
    - as Phase 1 clearing is of lower risk with regard to animal injury, it is sufficient for a single ecologist to supervise clearing activities on multiple fronts provided that they are contactable and available to respond to animal sightings on short notice.
- Phase 2 will include the removal of all trees likely to contain sheltering and/or nesting sites:
    - if safe to do without significant risk to plant operators, hollow bearing trees should be knocked several times with an excavator on the day prior to removal to encourage animals to move away immediately or overnight. Knocking should also be repeated immediately prior to the removal of hollow-bearing trees

- where safe for staff and practicable with regard to tree height and terrain, tree limbs containing hollows would be removed using tree-climbing techniques and/or an elevated work platform to allow hollows to be gently lowered to the ground, thus minimising the risk of injury to fauna.

- Clearing supervision (Phase 2) will include:

  - inspection of areas planned for Phase 2 clearing on a daily basis to detect any animals that may be present, particularly Koalas; if a Koala is sighted, clearing would not be undertaken within 30 m of the location until the Koala moves away

  - direct and constant supervision of clearing works, including inspection of trees immediately prior to and after felling to locate, capture and manage any animals encountered by clearing crews during clearing works

  - Uninjured animals would be temporarily housed and later relocated to similar habitat within the project area but at least 200 m away from the construction envelope

  - For injured animals, veterinary advice would be sought and animals would either be transferred to veterinarians or licenced wildlife carers or humanely euthanized

  - Euthanasia of animals would only be undertaken if advised by a veterinarian; euthanasia would either be undertaken by a veterinarian or as advised by a veterinarian and in accordance with an approved Animal Research Authority

  - Details of any vertebrate animals that are sighted, relocated, found dead or euthanized during clearing would be recorded and described in a clearing supervision report.

Where practicable, removal of hollow bearing trees would be undertaken in spring (September to November), and outside the main breeding period for hollow-dependent fauna likely to occupy the disturbance footprint, and when bat species are likely to be active and able to flee (i.e. not in torpor). If hollow-bearing trees are to be removed prior to September and/or after November, monitoring of breeding activity would be carried out by an ecologist/s approximately one week prior to the proposed tree removal as a part of pre-clearing surveys. If nesting activity is recorded, additional mitigation measures, such as short-term delays in the removal of trees or careful removal of nestlings for rearing by wildlife carers, would be recommended, as necessary.

iii Weed and pathogen management

Indirect impacts could occur due to the introduction and/or spread of weeds, or plant pathogens. There is also potential for the spread of weeds already established in the construction envelope to occur during construction activities, particularly clearing works, if weeds are not managed appropriately.

To prevent this occurring the following controls will be implemented:

- Baseline surveys of all areas within 50 m of the disturbance footprint to collect data on presence and abundance of weeds, particularly High Threat Weeds, to inform mitigation and management measures.

- A weed control protocol would be developed as part of the biodiversity management plan. This would aim to stop the spread of environmental weeds, particularly those listed as High Threat Weeds.

- Undertaking of weed control in key areas prior to construction works, to minimise the impacts of weeds during construction and to minimise the requirements for disposal and management of weeds on-site.

- Appropriate management and disposal of weed species during clearing works, in accordance with the BMP.

- Active and intensive weed control will be undertaken within 50 m of the disturbance footprint, in areas where significant weeds are known to occur to reduce the cover of weeds adjacent to the construction activities, preventing the spread of weeds into other areas.
- Vehicles, machinery and equipment must be clear of soil and plant debris when they arrive at the site and prior to movement between sites to minimise the potential for the introduction of weeds and pathogens.
- Wash-down stations will be constructed at suitable locations near entry points into key project components, with wash down for weeds as well as pathogens.
- A weed and pathogen monitoring program will be implemented, with a weed control program to be implemented if weeds are identified in the disturbance footprint.
- Revegetation of cleared areas as quickly as possible following construction works in an area.

iv Native vegetation and habitat restoration

As per section 7.1.2 of BAM 2020, direct and indirect impacts on biodiversity values can be avoidance/minimised through actions and activities that provide for rehabilitation, ecological restoration and/or ongoing maintenance of retained areas of native vegetation, threatened species, threatened ecological communities and their habitat on the subject land.

As such, a program of native vegetation and habitat restoration is proposed both for areas directly impacted by the project and other lands within the project area and more broadly.

a Native vegetation restoration

Progressively, and at the end of construction, temporary components that are required to support the construction of the project will be rehabilitated and returned to a state representing its previous use. Specifically, immediately following the cessation of use of temporary ancillary and construction work areas during and after completion of the project construction phase, extensive areas of the site will be rehabilitated. That is, 74 ha of the disturbance footprint will be rehabilitated.

Due to the steep terrain, the design often uses 1:1 batters to significantly reduce the footprint and therefore the clearing area. However, this results in batters that require scour protection rather than revegetation. As such, a combination of armour rock and scour protection, native tree vegetation, and grass revegetation will be employed throughout the project area based on suitability due to terrain.

In consultation with CPHR, Council, local indigenous groups and other stakeholders, the following measures will be implemented during rehabilitation to maximise the effectiveness of restoration of native vegetation and habitat:

- As soon as practicable, and over at least one spring-summer season prior to substantial vegetation clearing, a seed collection specialist should be employed to collect seed in the project area for use in revegetation. Collection of seed from large trees is likely to be most practical during vegetation clearing activities and should continue to be undertaken throughout the construction phase of the project.
- A native seed production nursery would be established prior to substantial vegetation clearing to ensure that a sufficient source of native grass and ground cover seeds are available for restoration activities.
- Where practicable, large surface rocks should also be moved into rehabilitated areas or retained native vegetation to provide habitat for ground-dwelling animals.

- Woody native vegetation removed from the disturbance footprint should be utilised for vegetation and habitat restoration preferentially. This should include mulching of shrubs and smaller trees for use in soil amelioration and use of large woody debris (i.e. large sections of tree trunks, root balls and large branches) for habitat enhancement in revegetation areas.

- Rehabilitation and revegetation will be undertaken as soon as practicable within temporary infrastructure locations and would include restoration of native species composition consistent with nearby areas of structurally intact native vegetation on similar soil and terrain.

- Areas requiring an active restoration approach would require preparatory earthworks to create conditions suitable for the reestablishment of near-natural vegetation. Earthworks in these areas would involve removal of topsoil with the associated elevated nutrient levels and weed seedbank and/or capping with a deep layer of rock and soil to provide conditions suitable for native species to grow and compete successfully with invasive species.

- Restoration would be targeted to ensure that it benefits the species impacted by the project by including plant species that provide foraging resources for native species such as:

    - dense stands of *Bursaria spinosa* subsp. *lasiophylla* planted in open sunny areas at 850 m altitude or higher that would be suitable for Purple Copper Butterfly

    - dense stands of *Allocasuarina littoralis* (Black She-oak) for Glossy Black Cockatoo; this aligns with a priority action listed for the recovery of the species “Encourage the restoration of foraging habitat that has been cleared or degraded by previous impacts”

    - locally preferred food trees for Koalas

    - shrub species that are used as food sources by Gang-gang Cockatoos, e.g. *Persoonia linearis* (Narrow-leaved Geebung), a species that Gang-gang Cockatoos were often observed feeding on.

- Restoration should be achieved, at least in part, by spreading topsoil stripped from donor sites in the disturbance footprint. Topsoil donor sites should have low weed cover.

- The success of native vegetation restoration should be monitored to determine whether any changes to management such as additional weed management or seedling or planting of native species are required.

- The measures outlined above would be included and expanded upon within a rehabilitation and restoration management plan to be prepared post-approval.

- Commitment to an environmental bond to ensure ongoing funding to support implementation and monitoring of the effectiveness of rehabilitation measures.

- In addition to areas to be restored within the disturbance footprint, LLP would look for opportunities for active restoration within the broader project area and elsewhere in the locality.

- The measures outlined above would be included and expanded upon within a habitat augmentation and research plans to be prepared post-approval.

8.3.4 Additional measures for local nature positive outcomes

In addition to the measures outlined in Section 8.3.3, LLP is considering a range of additional actions. Biodiversity values promoted through these actions will go above and beyond the required offset requirements of the NSW Biodiversity Offset Scheme and, and are aimed at providing nature positive, local outcomes for biodiversity in the vicinity of the project

i Additional vegetation restoration

In addition to restoring areas disturbed by temporary components of the project, LLP will look for opportunities for rehabilitation outside the construction envelope, such as some highly disturbed areas along the foreshore of Lake Lyell. There is approximately 20 ha of highly degraded land with potential for active restoration on the foreshores of Lake Lyell, outside of the construction envelope but within the broader project area, where significant benefit to biodiversity values could be achieved through restoring a native vegetation community. In particular, vegetation in this location would provide shelter for wetland associated birds, whilst improving connectivity for woodland associated fauna.

The following principles would guide any additional vegetation restoration in order to maximise their effectiveness:

- Restoration areas would be located strategically to increase habitat and improve connectivity for Koala and other species, particularly around the foreshores of Lake Lyell and on adjacent cleared land.
- Restoration areas would be surveyed to detect any threatened plant species that could be present, to determine vegetation condition, and to identify the most appropriate approach to restoration.
- Areas containing diverse native groundcover vegetation with a manageable weed component would be restored with an assisted natural regeneration approach, involving weed control and supplementary planting and/or seeding to improve native species diversity and vegetation structure.
- Restoration areas that are unsuitable for an assisted natural regeneration approach due to factors such as the absence of native vegetation, very low native species diversity (native pasture), clear dominance by exotic species, or unsuitable soil condition (nutrient enrichment) would require an active restoration approach.

ii Habitat augmentation and research

The following habitat augmentation and research measures are proposed to mitigate some of the impacts of the project on threatened species of animals and/or improve habitat values for threatened species in parts of the project area:

- Create cave-like habitat suitable for bats such as the Large Bent-winged Bat and Southern Myotis within structures, areas of rock excavation, and rock emplacements and monitor the artificial habitat for usage by bats. This aligns with a priority action listed for the recovery of Southern Myotis and other threatened cave-dwelling bat species “Promote roosting habitat in new artificial structures within the species range.” Similar cave-like habitat would also be designed specifically for Sooty Owl, if practicable.
- Installation of some of the larger tree trunks from trees felled within the construction envelope as supports for nest hollows within rehabilitation areas. Large tree trunks would be installed and large hollow logs, suitable for nesting by Powerful Owl or Sooty Owl, and Glossy Black Cockatoo or Gang-gang Cockatoo would be affixed at a height of at least 8 metres above ground level and the use of these structures by wildlife would be monitored and recorded.

- Undertake research into the status, ecology and distribution of the local population of Purple Copper Butterfly in Marrangaroo National Park and Lidsdale State Forest, thereby contributing to the priority action listed for the recovery of the species "Undertake research into ecological requirements of the Bathurst Copper Butterfly (BCB; synonymous with Purple Copper Butterfly), host Blackthorn and attendant ant". Use the results of this research to optimise restored habitat for the species in the project area and consider the potential for experimental translocation of attendant ants and/or Purple Copper Butterfly into restored areas. Successful captive breeding of the Purple Copper Butterfly efforts, as described in the species' recovery plan, indicates that translocation is feasible (NPWS 2001).

- Undertake research into the status, ecology and distribution of the Booroolong Frog in the natural system (above the level of the existing reservoir influence) of Farmers Creek and the Coxs River and its larger tributaries within the project area and Marrangaroo National Park, in order to assist in the management of the species in the locality if it persists there; noting that there are no records from the locality since the species was collected there in 1995.

- The research actions listed here would contribute to the management of Marrangaroo National Park, given that the Statement of Management Intent for the park indicates that "No native plant or native animal surveys have been conducted in the area" and that "Further research is required, including a comprehensive native animal survey identifying habitat for the Purple Copper Butterfly (Bathurst Copper Butterfly) and monitoring of populations"(OEH 2014).

- The earthworks associated with the project provide opportunities for the creation of new habitats in the project area in locations that are presently highly degraded, including features such as:

    - small island habitats within the reservoir, suitable as nesting and shelter habitat for waterbirds, turtles, Platypus, Rakali and other native semiaquatic animals, that would be inaccessible to foxes and cats during the operation of the project

    - shallow water zones which would be intermittently exposed and would have similar characteristics to intertidal mudflats, creating additional potential habitat for wading birds (e.g. Latham's Snipe)

    - off-reservoir wetland habitats with emergent aquatic vegetation, suitable for frogs and waterbirds in selected locations where small streams meet the lake; these habitats could be managed to exclude permanent occupation by exotic fish, thereby enhancing their potential as frog habitats

    - areas of large woody debris and rocks placed strategically at reservoir edges to provide cover for native aquatic and semi-aquatic species and perches for native birds.

8.3.5 Summary of measures to avoid, minimise and mitigate impacts

A summary of measures to avoid, minimise and mitigate impacts to biodiversity values is provided in Table 8.7.

Table 8.7 Summary of impacts and measures to avoid, minimise and mitigate

Impact	Impact avoidance	Impact minimisation	Impact mitigation
Removal of native vegetation and threatened species habitat. **Type**: direct impact. **Frequency**: once, during construction. **Intensity**: removal of large areas of habitat for threatened species. **Duration**: initial stages of construction. **Consequence**: permanent removal of native vegetation and threatened species habitat.	• Choice of a project location that does not require a new power transmission line, lower reservoir, water supply pipeline or large new roads/road upgrades. • Consideration of biodiversity values during design. • Siting of the proposed substation in areas of non-native and highly modified vegetation, where possible. • Siting of stockpiles for excavated materials in low-quality vegetation, where possible. • Siting of the accommodation camp in a cleared area.	• Detailed design of the project, seeking further minimisation of impacts to native vegetation. • Minimisation of clearing during construction, wherever possible. • Establishment of exclusion zones around retained vegetation, including fencing and signage. • Protection of retained trees through delineation of tree protection zones in accordance with Standards Australia, Protection of trees on development sites, Standards Australia, Sydney (AS2009).	• Mulching and stockpiling of cleared native vegetation for use during rehabilitation. • Retention of hollows logs and trunks/limbs for placement within retained vegetation and reuse during rehabilitation. • Collection of native seeds for propagation. • Propagation of locally indigenous native species for use in rehabilitation works. • Restoration of native species composition consistent with nearby areas of structurally intact native vegetation on similar soil and terrain.
Injury of native animals during clearing and construction **Type**: direct impact. **Frequency**: once, during construction. **Intensity**: an unknown proportion of the local populations of some animal species may be injured. **Duration**: initial stages of construction. **Consequence**: reduction in the population of susceptible threatened species.	• Not applicable.	• Detailed design of the project, resulting in further minimisation of impacts to native vegetation and fauna habitat. • Minimisation of clearing during construction, wherever possible.	• Pre-clearing surveys conducted prior to clearing, including translocation of less mobile fauna into areas of retained vegetation. • Vegetation clearing undertaken in accordance with the two-stage process.

Impact	Impact avoidance	Impact minimisation	Impact mitigation
Edge effects **Type**: indirect impact. **Frequency**: once, during construction and rehabilitation. **Intensity:** unknown. **Duration**: ongoing through construction phase. **Consequence**: potential to impact on threatened species habitat, resulting in decline in habitat quality due to introduction or spread of weeds and pathogens.	• Not applicable.	• Weed control prior to construction works being undertaken, where possible. • Appropriate disposal and management of weeds during clearing works. • Construction of wash-down stations at a suitable location. • Re-vegetation of cleared areas as quickly as possible following construction. • Vehicles, machinery and equipment to be clear of soil and plant debris when they arrive on the disturbance footprint and prior to movement between sites to minimise the potential for the introduction of weeds and pathogens.	• Design and implementation of a weed and pathogen monitoring program.
Disturbance to animals in adjacent habitat **Type:** indirect impact. **Frequency**: once, during construction. **Intensity:** unknown. **Duration:** ongoing during construction. **Consequence**: potential to result in noise impacts to retained vegetation and light spill into adjacent habitat areas, impacting on occupancy for some species.	• Not applicable.	• Implementation of construction traffic driving rules in high-risk sections of road speed limits and limitation of construction traffic movements at night. • Construction activities on the surface to only occur between 6:00 am and 6:00 pm.	• Use of directional lighting to retain lighting within work areas as much as possible.
Interruption of animal movement **Type:** indirect impact. **Frequency**: ongoing through construction and operation. **Intensity:** minor reduction in habitat connectivity at local and regional scale. **Duration:** permanent. **Consequence**: minor reduction in potential for dispersal between habitats on opposing sides of the disturbance footprint in several areas.	• Not applicable.	• Minimisation of tree clearing during detailed design and construction of the access road upgrade and temporary access tracks.	• Rehabilitation and revegetation within temporary infrastructure locations and elsewhere in the project area. • Design of site fencing to allow movement of native animals between areas of habitat.

Impact	Impact avoidance	Impact minimisation	Impact mitigation
Vehicle strikes impacts on animal populations **Type:** indirect impact, prescribed impact. **Frequency**: once, through construction. **Intensity:** minor increase in roadkill rate. **Duration:** temporary, during construction. **Consequence**: minor reduction in populations of susceptible species.	• Not applicable.	• Implementation of construction traffic driving rules in high-risk sections of road speed limits and limitation of construction traffic movements at night.	• Construction traffic rules at night.

9 Serious and irreversible impacts (SAII)

Section 9.1.2 of the BAM 2020 requires additional impact assessment for threatened species that are listed in the TBDC as possibly at risk of SAII and known or likely to occur in the disturbance footprint.

Potential SAII entities known or likely to occur in the disturbance footprint are Large bent-winged bat, Sooty Owl, Regent Honey eater and Swift Parrot. All species were excluded from the need for further SAII assessment due to a lack of breeding habitat or the project not having any impact on lands within the important habitat map for the species.

Table 9.1 provides an assessment of SAII triggers for these species known or predicted to occur in the construction envelope that are listed as possibly at risk of SAII and justification of why further assessment is not considered required.

Table 9.1 Threatened species requiring assessment of SAII

Species	Potential SAII Trigger	Reason for inclusion or exclusion from further assessment
Large bent-winged bat	According to the information provided for the species in the TBDC: • "Any impacts on breeding habitat could be considered potentially serious and irreversible". • "Potential breeding habitat is caves, tunnels, mines or other structures known or suspected to be used by *M. schreibersii oceanensis* including species records in BioNet with microhabitat code 'IC – in cave'; observation type code 'E nest-roost'; with numbers of individuals >500; or from the scientific literature. All breeding habitat including the cave, or other features, used for breeding and the area immediately surrounding this feature must be mapped." • "Species polygon boundaries should have a 100 m radius buffer around an accurate GPS point location centred on the cave / feature entrance." Maternity sites consist of deep caves with very specific and stable humidity and temperature conditions (Dwyer and Hamilton-Smith, 1965).	Excluded. No karst (eroded limestone landscape) features are found in the construction envelope. No quartz sandstone geology, typical of the cliffs and gorges of the nearby Blue Mountains area, is found on in the construction envelope. The predominantly metasedimentary (quartzite), fine-grained sedimentary (mudstone) and granite geology of the locality is not typically associated with substantial cave formation. The only large outcroppings of rock are found in the vicinity of Mt Walker, located 50 to 100 m north of the site. These areas contain large crevices and small cavities but do not appear to contain any caves. Rocky areas in the Mount Walker area contain only very small cliffs, around 5 to 15 m high, without any overhangs or protected areas suitable for animals to shelter. There are no caves, tunnels, mines or other structures known or suspected to be used by the Large bent-winged bat, nor any existing records of the species within the Project Envelope or within 100 m of the Project Envelope These species were recorded in the disturbance footprint by ultrasonic bat call recording. The recorded activity of the species was not consistent with the presence of a large colony of the species. The species is not at risk of a SAII as a result of the project as breeding habitat is unlikely to be affected. The species is excluded from further SAII assessment. Despite the lack of an impact on potential breeding habitat, opportunities to create cave-like habitats potentially suitable for breeding in rock cutting faces, rock embankments and other excavations would be explored, and if feasible, incorporated into the design of the project.

Species	Potential SAII Trigger	Reason for inclusion or exclusion from further assessment
Sooty Owl	Listed only under Principle 4 - species or ecological community that is unlikely to respond to management and is therefore irreplaceable. The consideration of whether an entity is unlikely to respond to management encompasses two key elements: Factors affecting whether a is unlikely to respond to management include: • Life history traits and/or ecology which is known, but the ability to control key threats at the site scale is negligible. In general, these are species significantly threatened by uncontrollable disease (e.g. frogs highly threatened by chytrid fungus). • Known reproductive characteristics that severely limit their ability to increase the existing population on, or occupy new habitat at, a stewardship site. In general, these are plants that are sterile or largely clonal with no or very limited capacity to increase in number through seed production and recruitment. • Consideration of impacts on habitat components that cannot readily be re-created. In general, these are impacts on essential habitat such as caves or cliff lines that are used by threatened species. No justification is currently provided in the TBDC for the listing of the species under principle 4. Previously, impacts on caves, and escarpments (clifflines / ledges) was identified as a factor putting the species at risk of SAII as these abiotic habitat components are considered irreplaceable as they cannot readily be re-created.	Excluded. The Sooty Owl is not significantly threatened by uncontrollable disease nor any other threats that are unable to be controlled at a site scale. The main threats to the species are from clearing and fragmentation of habitat, including loss of hollow-bearing trees. Generation length is estimated as five years, on the basis that smaller Tyto owls (e.g. Barn Owl) are highly fecund and can breed at one year old, and the Sooty Owl appears similarly fecund in captivity (NSW Scientific Committee 2008). The ability to control key threats to the species at the site scale is not negligible and the species is unlikely to have reproductive characteristics that would severely limit its ability to increase in population. The only factor under Principle 4 of relevance to the Sooty Owl is consideration of impacts on habitat components that cannot readily be re-created. The project would not have any impact on caves or escarpments (clifflines / ledges) and so it is unlikely to trigger a serious and irreversible impact. The species is excluded from further SAII assessment. Despite the lack of an impact, opportunities to create cave-like habitats and clifflines / ledges in rock cutting faces, rock embankments and other excavations would be explored, and if feasible, incorporated into the design of the project.
Regent Honeyeater Swift Parrot	These species are dual credit species, assessed for species credits (important habitat map) and ecosystem credits (all other areas the species is likely to occur). The TBDC contains the following reference to these species “If the species is at risk of a serious and irreversible impact (SAII), the area mapped as important habitat is the area identified as a potential SAII and section 9.1 of the BAM must be addressed.”	Excluded. The project would not have any impact on lands within the important habitat map for either species and so it is unlikely to trigger a serious and irreversible impact. The species is excluded from further SAII assessment.

10 Cumulative impacts

10.1 Approach

The *Cumulative Impact Assessment Guidelines for State Significant Projects* (DPIE 2022) requires consideration of how the project, combined with nearby future projects, will impact upon threatened species and ecological communities (threatened entities). Given the nature of the impact, it was considered appropriate to focus the Cumulative Impact Assessment (CIA) on key matters where the potential cumulative impact could be significant. The following are identified as key threatened entities, for the purposes of the CIA:

- Gang-Gang Cockatoo
- Glossy Black Cockatoo
- Koala
- Powerful Owl
- Purple Copper Butterfly.

Note that although section 3.2 of the DPIE (2022) guideline suggests undertaking a CIA for species listed as an SAII entity only, this was considered inappropriate in the case of the project. This was because although two SAII entities, Sooty Owl and Large Bent-winged Bat utilise habitat in the project area, the project will not impact habitat types for these two species that are associated with SAII. The CIA focuses on key threatened species, particularly those that are considered most likely to be impacted by other projects in the surrounding region.

The study area for the CIA was considered within 20 km of the project area (hereafter CIA study area), noting that most of this area was located within the Lithgow LGA but also encompassing a small extent of Bathurst Regional LGA and Blue Mountains City LGA. This 20 km distance from the project was considered appropriate for the CIA given that it encompasses an area of largely connective habitat likely to be important for local populations of the above five key threatened species given their relatively high mobility (i.e. all five species can disperse kms to 10s of km). Restricting the CIA study area to specific IBRA subregions was not required since all five species may occur within the Hill End, Bathurst, Wollombi, Oberon, Burragorang and Capertee Uplands IBRA subregions, which occur within 20 km of the project area.

Future projects conserved relevant to the project were identified through:

- EPBC Act Public Portal (DCCEEW 2025d)
- Major Project search tool (DPHI 2025)
- Lithgow City Council (LCC) projects on exhibition (LCC 2025)
- Blue Mountains City Council (BMCC) projects on exhibition (BMCC 2025)
- Bathurst Regional Council (BRC) projects on exhibition (BRC 2025).

Search of the Major Project search tool and EPBC Act Public Portal included Major / Referred Projects in Lithgow LGA, Bathurst LGA and Blue Mountains LGA, with focus on projects inside the 20 km CIA study area. Search of the projects currently exhibited by relevant Councils (Lithgow, BMCC and BRC) focused on identifying large developments only (i.e. large housing subdivisions or commercial development), which may materially contribute to a cumulative impact for the above five key threatened species potentially through clearing of large extents of native vegetation.

Projects considered relevant to the CIA were those currently being assessed or given approval within the last 5 years, where clearing of native vegetation is proposed. Only projects where native vegetation will be cleared were considered in this assessment (i.e. the uncertain nature of impacts to biodiversity from underground mining were not included).

The above searches for relevant nearby projects found six projects may contribute to cumulative impacts to biodiversity in the CIA study area in the future:

- Wallerawang Quarry Modification 3 (DA344-11-2001-Mod-3)
- Wallerawang Battery Energy Storage System (SSD-14540514)
- Great Western Highway Blackheath to Little Hartley (SSI-22004371)
- Mt Piper Battery Energy Storage System (SSD-50903958)
- Mount Piper to Wallerawang Transmission Line Upgrade Project (SSI-70279722)
- Great Western Battery Energy Storage System (SSD-12346552).

Based on these relevant future projects in combination with Lake Lyell PHES, the CIA sought to quantify:

- Extent of cumulative impact for habitat for the key species (listed above)
- Cumulative proportion of potential habitat to be impacted for the key species in the CIA
- Identify any cumulative impacts to connectivity due to the cumulative impacts of relevant future projects.

The overall extent of potential habitat for these species to be impacted, as well as habitat available within the CIA study area, was assumed to be PCTs associated with these threatened species as per the TBDC (BCS 2025b). The extent of potential habitat (i.e. associated PCTs) was within the CIA study area was estimated from the SVTM (NSW DCCEEW 2022a). The extent of habitat to be cleared for the five key threatened species by projects in the CIA study area was informed by the BDAR or scoping report for relevant projects, which were publicly accessible via the NSW Major Project Portal. Condition of vegetation to be impacted by the projects was not considered in the CIA, except for the Lake Lyell PHES assessed in the current report.

Note that no local projects were found to be impacting biodiversity values to an extent that required consideration in the CIA nor were any relevant EPBC Act controlled actions that were not listed on the NSW Major Project Portal found. Where the extent of PCTs being cleared was provided in the BDAR/scoping report, it was assumed that all native vegetation proposed to be cleared consisted of habitat for the five key threatened species. That is, all areas of associated PCTs were included, without consideration of the presence or absence of habitat and geographic constraints.

The potential cumulative impact of other projects on the five key threatened species is estimated in Section 10.2 below.

10.2 Consideration of cumulative impacts related to biodiversity

Cumulative impacts are expected for Gang-gang Cockatoo, Glossy Black Cockatoo, Koala, Powerful Owl and Purple Copper Butterfly (i.e. key threatened species) due to the Lake Lyell PHES project in combination with nearby future projects in the CIA study area. That is, the combined impact of the project with relevant nearby projects that are anticipated to have future impacts on biodiversity values, ranges from approx. 114.36 to 206.41 ha for the five key threatened species considered in the CIA (refer to Table 10.1). The cumulative area of impact constitutes a small proportion of potentially suitable habitat for these species in the CIA study area. That is, in the 20 km area outside of the project area, the available habitat for these key species according to the SVTM ranges from approx. 69,661.71 to 86,417.14 ha. Hence, the cumulative impact of future projects in this CIA study area is expected to lead to the loss of approx. 0.16 % to 0.25% of habitat available for the key threatened species. Further, large extents of remnant habitat are protected in this CIA study area in Marrangaroo National Park and Gardens of Stone State Conservation Area.

The potential cumulative impact of the project and nearby future project are also not expected to considerably impact habitat connectivity for the five key threatened species. That is, there were no future projects identified, which in combination with the PHES project, would inhibit movement of any of the five key threatened species. For instance, the nearest future project identified in the CIA was the extension to Wallerawang Quarry Modification 3, which is approximately 6 km north of the project. This quarry expansion will lead to incremental loss of an overall large parcel of native vegetation in which the project is located, but it is not expected that an interactive impact with the project would reduce connectivity for any threatened species given it is well away from the project.

Table 10.1 Cumulative Impact Assessment on key threatened species

Item	Wallerawang Quarry Modification 3	Wallerawang Battery Energy Storage System	Great Western Battery Energy Storage System	Great Western Highway Blackheath to Little Hartley	Mount Piper Battery Energy Storage System[1]	Mount Piper to Wallerawang Transmission Line Upgrade Project	Lake Lyell PHES	Cumulative Impact (% of available habitat in CIA study area)
Application Number	DA344-11-2001-Mod-3	SSD-14540514	SSD-12346552	SSI-22004371	SSD-50903958	SSI-70279722	SSD-60598738	NA
Assessment process stage	Approved	Approved	Approved	Response to Submissions	Approved	Exhibition	Prepare EIS	NA
Gang-gang Cockatoo habitat potentially directly impacted (ha)	14.10	1.15	11.90	9.71	14.01	55.42	101.35	208.79 (0.24%)
Glossy Black Cockatoo habitat potentially directly impacted (ha)	14.10	1.15	11.90	9.71	14.01	53.04	101.35	206.41 (0.24%)
Koala habitat potentially directly impacted (ha)	14.10	0.00	11.37	9.71	14.01	41.46	99.31	189.96 (0.25%)
Powerful Owl habitat potentially directly impacted (ha)	14.10	1.15	11.90	9.71	14.01	53.04	96.01	201.07 (0.25%)
Purple Copper Butterfly habitat potentially directly impacted (ha)	14.10	1.15	11.90	9.71	14.01	53.04	9.3	114.36 (0.16%)

Notes:

1. Assuming combined impact of BESS and grid connection option with the greatest impact on native vegetation.

11 Impact summary

11.1 Impacts not requiring offsets

Areas not requiring assessment in accordance with section 9.3 of BAM (DPIE 2020a) include:

- existing roads
- cleared and highly disturbed land
- water bodies with no emergent vegetation.

In accordance with section 9.2.1 of BAM (DPIE 2020a), impacts on vegetation zones and threatened species habitat do not require offsets where:

- a vegetation zone representative of a critically endangered or endangered ecological community and has a vegetation integrity score less than 15, and/or
- a vegetation zone representative of a vulnerable ecological community and/or threatened species habitat and has a vegetation integrity score less than 17, and/or
- a vegetation zone that is not listed has a vegetation integrity score less than 20, does not represent a TEC and is not associated with threatened species habitat.

Table 11.1 to Table 11.4 provide summaries of the vegetation zones above thresholds for early works, separated by IBRA subregions. Table 11.5 summarises the vegetation zones above thresholds for main works, all within the Hill End IBRA subregion.

Areas of the disturbance footprint that do not generate an offset are displayed in Figure 11.1.

Table 11.1 Summary of impacts not requiring offsets for early works – Hill End IBRA subregion

PCT ID	PCT name	Vegetation zone	Extents within disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_DEGH	0.32	9.1	0	-9.1	0

Table 11.2 Summary of impacts not requiring offsets for early works – Bathurst IBRA subregion

PCT ID	PCT name	Vegetation zone	Extents within disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_Sedge	0.75	13.8	0	-13.8	0
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	3348_DEGH	2.96	10.5	0	-10.5	0
		3348_Exotic	0.17	8.4	0	-8.4	0
3367	Central Tableland Granites Grassy Box Woodland	3367_DNG_Poor	10.88	18.1	0	-18.1	0
		3367_DEGH	1.30	10.6	0	-10.6	0

Table 11.3 Summary of impacts not requiring offsets for early works - Burragorang IBRA subregion

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3385	Southern Tableland Creekflat Swamp Woodland	3385_DEGH	2.11	7.2	0	-7.2	0
3687	Newnes Plateau Peppermint-Ash Tall Forest	3687_DEGH	5.97	13.1	0	-13.1	0

Table 11.4 Summary of impacts not requiring offsets for early works –Wollemi IBRA subregion

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3687	Newnes Plateau Peppermint-Ash Tall Forest	3687_DEGH	2.88	16.4	0	-16.4	0

Table 11.5 Summary of impacts not requiring offsets for main works (Hill End IBRA subregion)

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3347	Southern Tableland Creekflat Ribbon Gum Forest	3347_DEGH	0.36	9.1	0	-9.1	0

11.2 Impacts requiring offset

This section provides an assessment of the impacts requiring offsetting in accordance with the BAM (DPIE 2020a).

11.2.1 Impacts on native vegetation requiring offsets

A total of 3,989 ecosystem credits are required to offset the project, consisting of 416 ecosystem credits for early works and 3,573 ecosystem credits for the main works.

A summary of ecosystem credits required for all vegetation zones for early works, including changes in vegetation integrity score, are provided in Table 11.6 for the Hill End IBRA subregion, Table 11.7 for the Bathurst IBRA subregion, Table 11.8 for the Burragorang IBRA subregion and Table 11.9 for the Wollemi IBRA subregion. A summary of ecosystem credits required for main works, including changes in vegetation scores, is provided in Table 11.10. Vegetation zones that require an offset are displayed in Figure 11.1. Credit reports are provided in Appendix E.

Table 11.6 Ecosystem credits for impacts to vegetation zones - early works in Hill End IBRA subregion

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)[1]	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3211	Central Tableland Montane Wet Forest	3211_Moderate	0.48	76.4	0	-76.4	14
Total credits for PCT 3211							**14**
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	3348_Moderate	0.18	64.9	0	-64.9	6
Total credits for PCT 3348							**6**
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	1.50	86.1	0	-86.1	65
		3367_DS	0.10	59.8	0	-59.8	3
		3367_Poor	0.17	79.5	0	-79.5	7
Total credits for PCT 3367							**75**
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	3369_Moderate	1.20	97.6	0	-97.6	51
Total credits for PCT 3369							**51**

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)[1]	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_High	0.19	81.4	0	-81.4	6
Total credits for PCT 3650							**6**
3735	Central Tableland Peppermint Shrub-Grass Forest	3735_High	2.23	93.9	0	-93.9	92
Total credits for PCT 3735							**92**
3747	Southern Tableland Western Hills Scribbly Gum Forest	3747_High	1.05	89.4	0	-89.4	41
Total credits for PCT 3747							**41**
Overall total ecosystem credits for early works in the Hill End subregion							**285**

Table 11.7 Ecosystem credits for impacts to vegetation zones - early works in Bathurst IBRA subregion

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	3348_DNG	0.13	31.4	0	-31.4	2
		3348_Moderate	2.94	72.8	0	-72.8	107
		3348_Poor	0.36	23.4	0	-23.4	4
Total credits for PCT 3348							**113**
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	0.11	60.8	0	-60.8	3
Total credits for PCT 3367							**3**
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_Moderate	0.05	82.4	0	-82.4	2
Total credits for PCT 3650							**2**
Overall total ecosystem credits for the - early works in Bathurst IBRA subregion							**118**

Table 11.8 Ecosystem credits for impacts to vegetation zones - early works in Burragorang IBRA subregion

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3385	Southern Tableland Creekflat Swamp Woodland	3385_Poor	0.36	38.5	0	-74.7	7
		3385_DNG	0.25	29.6	0	-29.6	4
Total credits for PCT 3385							**11**
Overall total ecosystem credits for early works in the Burragong subregion							**11**

Table 11.9 Ecosystem credits for impacts to vegetation zones - early works in Wollemi IBRA subregion

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3687	Newnes Plateau Peppermint-Ash Tall Forest	3687_Moderate	0.05	26.1	0	-26.1	1
		3687_DNG_Poor	0.03	20.4	0	-20.4	1
Total credits for PCT 3687							**2**
Overall total ecosystem credits for early works in the Wollemi subregion							**2**

Table 11.10 Ecosystem credits for impacts to vegetation zones main works (Hill End IBRA subregion)

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)[1]	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3211	Central Tableland Montane Wet Forest	3211_Moderate	6.82	76.4	0	-76.4	195
Total credits for PCT 3211							**195**
3367	Central Tableland Granites Grassy Box Woodland	3367_Moderate	5.60	86.1	0	-86.1	241
		3367_DS	0.71	59.8	0	-59.8	21
		3367_Poor	3.92	79.5	0	-79.5	156
Total credits for PCT 3367							**418**

PCT ID	PCT name	Vegetation zone	Extent in disturbance footprint (ha)[1]	Current vegetation integrity score	Future vegetation integrity score	Change in vegetation integrity score	Credits required
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	3369_Moderate	24.84	97.6	0	-97.6	1,061
Total credits for PCT 3369							**1,061**
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	3650_High	8.57	81.4	0	-81.4	261
Total credits for PCT 3650							**261**
3735	Central Tableland Peppermint Shrub-Grass Forest	3735_High	33.26	93.9	0	-93.9	1,367
Total credits for PCT 3735							**1,367**
3747	Southern Tableland Western Hills Scribbly Gum Forest	3747_High	6.94	89.4	0	-89.4	271
Total credits for PCT 3747							**271**
Overall total ecosystem credits for main works in the Hill End subregion							**3,573**

11.2.2 Impacts on threatened species requiring offsets

A total of 18,115 species credits are required to offset the project, 1,188 for early works and 16,927 for main works consisting of:

- Gang-gang Cockatoo - 2,329 credits (137 credits for early works and 2,192 credits for main works)
- Glossy Black Cockatoo - 200 credits (4 credits for early works and 196 credits for main works)
- Koala - 4,522 credits (431 credits for early works and 4,091 credits for main works)
- Powerful Owl – 4,053 credits (214 credits for early works and 3,839 credits for main works)
- Purple Copper Butterfly - 405 credits (14 credits for early works and 391 credits for main works)
- Sooty Owl -5,292 credits (249 credits for early works and 5,043 credits for main works)
- Southern Myotis - 1,314 credits (139 credits for early works and 1,175 credits for main works).

A summary of the species credits required for early works for all vegetation zones occupied by the threatened species, separated by IBRA subregion, is provided in Table 11.11 and Table 11.12. Table 11.13 provides a summary of species credits required for main works for all vegetation zones occupied by the threatened species, all within the Hill End IBRA subregion. Credit reports are provided in Appendix E. Offsets will be provided in accordance with the biodiversity offset framework outlined in Chapter 12.

Table 11.11 Threatened species credits required for early works impacts in the Hill End IBRA subregion

Scientific name	Common name	Potential SAII	Vegetation zones in species polygon	Area (ha)	Credits required
Callocephalon fimbriatum	Gang-gang Cockatoo	No	3747_High	1.02	46
			3735_High	0.98	46
			3650_High	0.14	6
			3369_Moderate	0.64	31
			3211_Moderate	0.22	8
Total credits for Gang-gang Cockatoo					**137**
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	No	3369_Moderate	0.02	1
			3735_High	0.06	3
Total credits for Glossy Black Cockatoo					**4**
Myotis macropus	Southern Myotis	No	3747_High	0.24	11
			3735_High	0.89	42
			3367_Moderate	0.3	13
			3348_Moderate	0.18	6
			3369_Moderate	0.46	22
			3367_Poor	0.12	5
Total credits for Southern Myotis					**99**
Ninox strenua	Powerful Owl	No	3747_High	1.05	47
			3735_High	1.72	81
			3650_High	0.19	8
			3367_Moderate	0.01	1
			3369_Moderate	1.2	59
			3211_Moderate	0.48	18
Total credits for Powerful Owl					**214**
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	No	3747_High	0.21	9
			3735_High	0.10	5
			3650_High	0.14	6
			3367_DS	0.08	2
			3367_Moderate	0.21	9
			3348_Moderate	0.08	3
Total credits for Purple Copper Butterfly (Bathurst Copper Butterfly)					**34**

Scientific name	Common name	Potential SAII	Vegetation zones in species polygon	Area (ha)	Credits required
Phascolarctos cinerea	Koala	No	3747_High	1.05	47
			3735_High	2.23	105
			3650_High	0.19	8
			3367_Moderate	1.5	65
			3348_Moderate	0.18	6
			3369_Moderate	1.2	59
			3211_Moderate	0.48	18
			3367_Poor	0.17	7
Total credits for Koala					**315**
Tyto tenebricosa	Sooty Owl	Yes	3211_Moderate	0.48	28
			3735_High	1.72	121
			3369_Moderate	1.2	88
			3650_High	0.19	12
Total credits for Sooty Owl					**249**

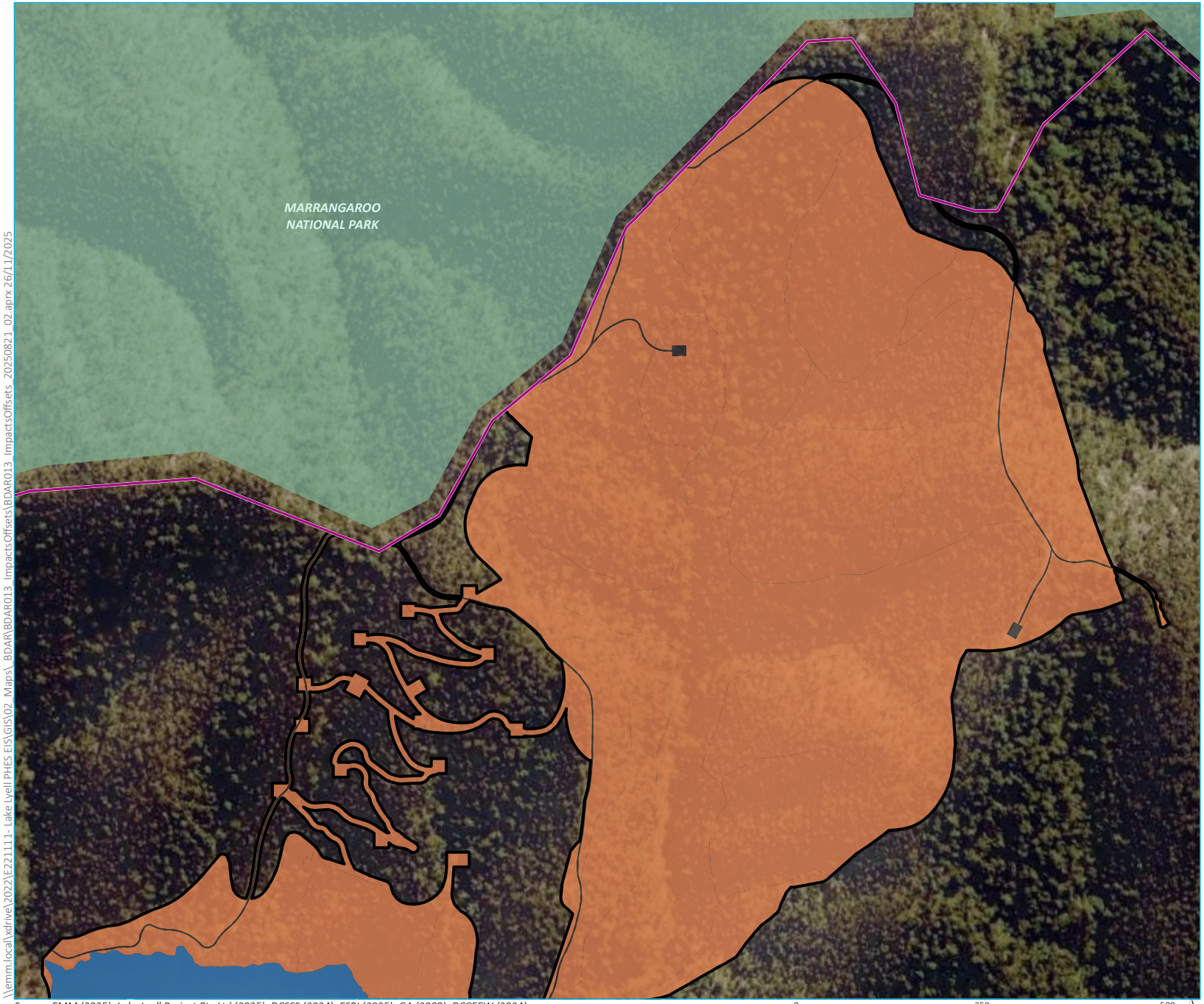
Table 11.12 Threatened species credits required for early works impacts in Bathurst IBRA subregion

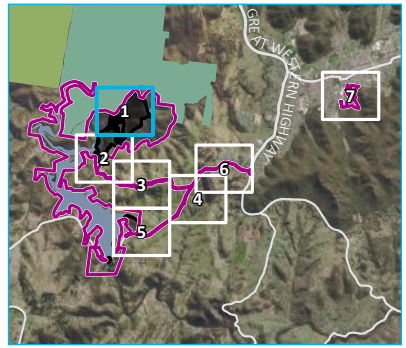
Scientific name	Common name	Potential SAII	Vegetation zones in species polygon	Area (ha)	Credits required
Myotis macropus	Southern Myotis	No	3348_Moderate	0.99	36
			3348_Poor	0.15	2
			3650_Moderate	0.05	2
Total credits for Southern Myotis					**40**
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	No	3348_Moderate	0.08	3
Total credits for Purple Copper Butterfly (Bathurst Copper Butterfly)					**3**
Phascolarctos cinerea	Koala	No	3348_Moderate	2.9	107
			3348_Poor	0.36	4
			3367_Moderate	0.11	3
			3650_High	0.05	2
Total credits for Koala					**116**

Table 11.13 Threatened species credits required for main works impacts (Hill End IBRA subregion) – area assessment

Scientific name	Common name	Potential SAII	Vegetation zones in species polygon	Area (ha)	Credits required
Callocephalon fimbriatum	Gang-gang Cockatoo	No	3211_Moderate	1.46	56
			3367_Moderate	0.66	28
			3369_Moderate	16.25	793
			3650_High	3.32	135
			3735_High	19.7	925
			3747_High	5.7	255
Total credits for Gang-gang Cockatoo					**2,192**
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	No	3369_Moderate	2.33	114
			3735_High	1.49	70
			3747_High	0.27	12
Total credits for Glossy Black Cockatoo					**196**
Myotis macropus	Southern Myotis	No	3367_Moderate	4.9	211
			3367_Poor	2.98	118
			3369_Moderate	5.13	250
			3735_High	11.43	537
			3747_High	1.33	59
Total credits for Southern Myotis					**1,175**
Ninox strenua	Powerful Owl	No	3211_Moderate	6.82	261
			3367_Moderate	0.72	31
			3367_Poor	3.42	136
			3369_Moderate	24.75	1,208
			3650_High	8.57	349
			3735_High	32.87	1,544
			3747_High	6.94	310
Total credits for Powerful Owl					**3,839**
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	No	3367_Moderate	0.54	23
			3369_Moderate	2.9	144
			3650_High	0.26	11
			3735_High	2.8	129
			3747_High	1.9	84
Total credits for Purple Copper Butterfly (Bathurst Copper Butterfly)					**391**

Scientific name	Common name	Potential SAII	Vegetation zones in species polygon	Area (ha)	Credits required
Phascolarctos cinerea	Koala	No	3211_Moderate	6.82	261
			3367_Moderate	5.6	241
			3367_Poor	3.92	156
			3369_Moderate	24.84	1,212
			3650_High	8.57	349
			3735_High	33.25	1,562
			3747_High	6.94	310
Total credits for Koala					**4,091**
Tyto tenebricosa	Sooty Owl	Yes	3211_Moderate	6.82	391
			3369_Moderate	24.75	1,812
			3650_High	8.57	523
			3735_High	32.88	2,317
Total credits for Sooty Owl					**5,043**





KEY

- Project area
- Subject land
- Impacts requiring offsets

Areas not requiring assessment

- Minimal vegetation
- Waterbody of Lake Lyell

Existing environment

- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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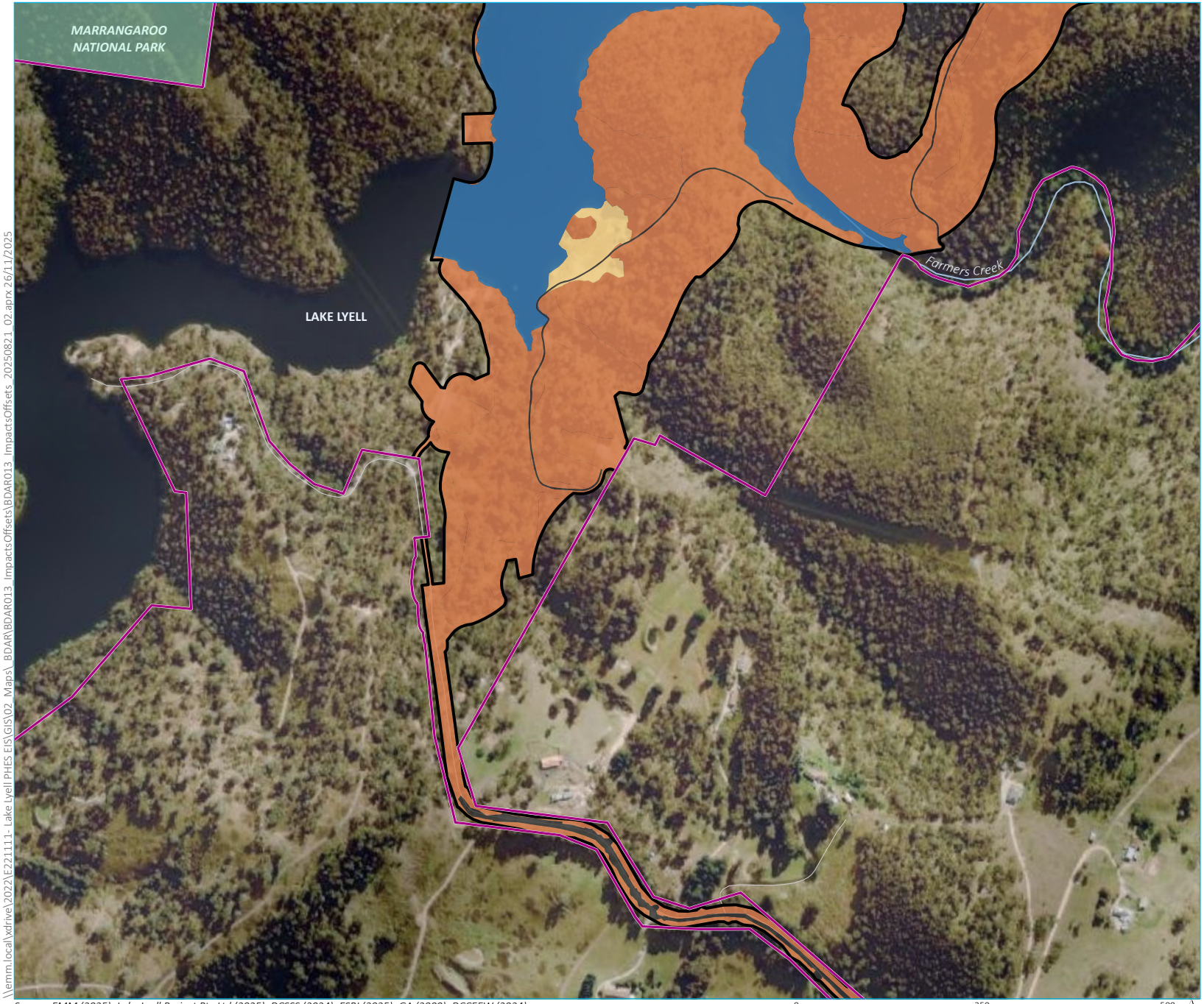
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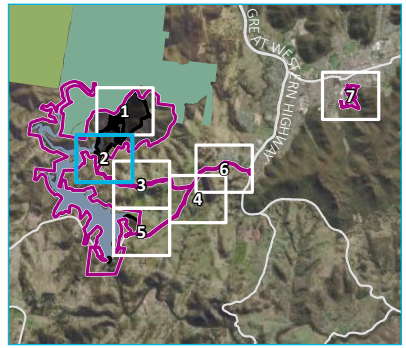
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Impacts requiring offset and impacts not requiring offsets
Map 1 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 11.1

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KEY

- Project area
- Subject land
- Impacts requiring offsets
- Impacts not requiring offsets

Areas not requiring assessment

- Minimal vegetation
- Waterbody of Lake Lyell

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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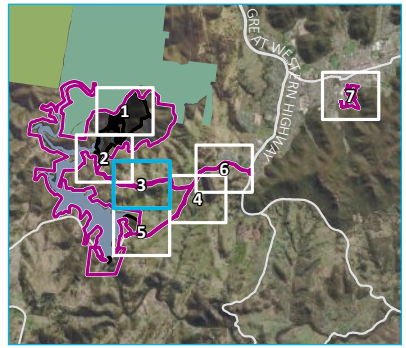
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Impacts requiring offset and impacts not requiring offsets
Map 2 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 11.1

EMM
creating opportunities





KEY

- Project area
- Subject land
- Impacts requiring offsets
- Impacts not requiring offsets

Areas not requiring assessment

- Minimal vegetation

Existing environment

- Minor road
- Named watercourse
- NPWS reserve
- State forest

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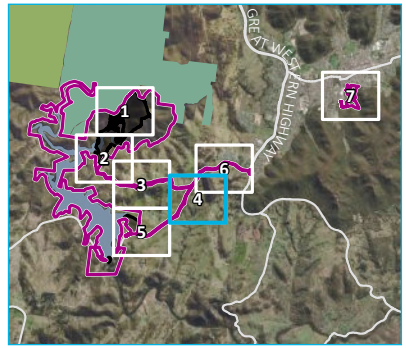
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Impacts requiring offset and impacts not requiring offsets
Map 3 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 11.1

EMM
creating opportunities





KEY

- Project area
- Subject land
- Impacts requiring offsets
- Impacts not requiring offsets

Areas not requiring assessment

- Minimal vegetation

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Impacts requiring offset and impacts not requiring offsets
Map 4 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 11.1

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

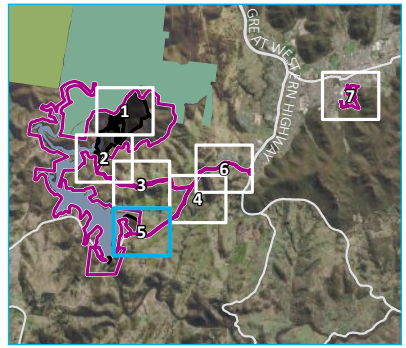
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KEY

- Project area
- Subject land
- Impacts requiring offsets
- Impacts not requiring offsets

Areas not requiring assessment

- Minimal vegetation
- Waterbody of Lake Lyell

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

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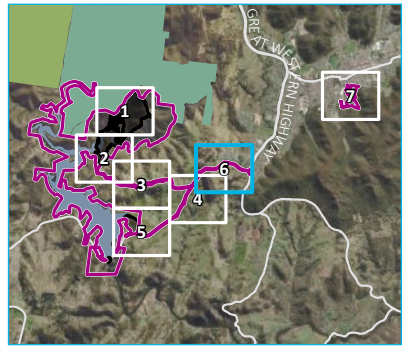
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Impacts requiring offset and impacts not requiring offsets
Map 5 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 11.1

EMM
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KEY

- Project area
- Subject land
- Impacts requiring offsets
- Impacts not requiring offsets

Areas not requiring assessment

- Minimal vegetation

Existing environment

- Major road
- Minor road
- Named watercourse
- NPWS reserve
- State forest

Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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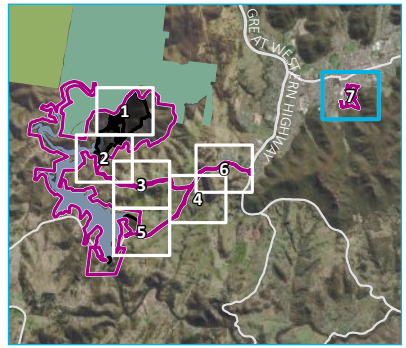
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Impacts requiring offset and impacts not requiring offsets
Map 6 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 11.1

EMM
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KEY

- Project area
- Subject land
- Impacts requiring offsets

Areas not requiring assessment

- Minimal vegetation

Existing environment

- Major road
- Minor road
- NPWS reserve
- State forest

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Source: EMM (2025); Lake Lyell Project Pty Ltd (2025); DCSSS (2024); ESRI (2025); GA (2009); DCCEEW (2024)

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Impacts requiring offset and impacts not requiring offsets
Map 7 of 7

Lake Lyell PHES
Biodiversity Development Assessment Report
Figure 11.1

EMM
creating opportunities

12 Biodiversity offset strategy

12.1 Offset requirements

Impacts and offset requirements for the project are outlined above. The project will result in clearing of approximately 105.17 ha of native vegetation of varying condition and habitat for threatened species that requires biodiversity offsets.

A summary of ecosystem credit offsets and species credit offsets requirements are provided in Table 12.1 and Table 12.2, respectively. A consolidated summary of the offset requirements is provided in Appendix E and summarised in credit class in Table 12.3. The credit calculations are based upon the layout as currently proposed, and may change, subject to final design. Offset requirements will be updated in the Biodiversity Offset Package to be prepared prior to any development being carried out that would impact on biodiversity values.

Table 12.1 Summary of ecosystem credit offsets requirements for the project

PCT ID	Name of PCT triggering offset requirement	Offset trading group	Early works credit required	Main works credit required	Total credits required
3211	Central Tableland Montane Wet Forest	Southern Escarpment Wet Sclerophyll Forests <50%	14	195	209
3348	Southern Tableland Granites Ribbon Gum Grassy Forest	Tableland Clay Grassy Woodlands ≥70% to <90%	119	0	119
3367	Central Tableland Granites Grassy Box Woodland	Southern Tableland Grassy Woodlands ≥70% to <90%	78	418	496
3369	Central Tableland Ranges Peppermint-Gum Grassy Forest	Southern Tableland Grassy Woodlands ≥50 to <70%	51	1,061	1,112
3385	Southern Tableland Creekflat Swamp Woodland	Subalpine Woodlands ≥70% to <90%	11	0	11
3650	Goulburn-Lithgow Ranges Silvertop Ash Forest	South East Dry Sclerophyll Forests <50%	8	261	269
3687	Newnes Plateau Peppermint-Ash Tall Forest	Sydney Montane Dry Sclerophyll Forests <50%	2	0	2
3735	Central Tableland Peppermint-Shrub Grass Forest	Southern Tableland Dry Sclerophyll Forests ≥50 to <70%	133	1,638	1,771
3747	Southern Tableland Western Hills Scribbly Gum Forest				
Total ecosystem credits required			416	3,573	**3,989**

Table 12.2 Summary of species credit offsets requirements for the project

Scientific Name	Common Name	Early works credit required	Main works credit required	Total credits required
Callocephalon fimbriatum	Gang-Gang Cockatoo	137	2,192	2,329
Calyptorhynchus lathami lathami	Glossy Black Cockatoo	4	196	200
Ninox strenua	Powerful Owl	214	3,839	4,053
Paralucia spinifera	Purple Copper Butterfly (Bathurst Copper Butterfly)	14	391	405
Phascolarctos cinereus	Koala	431	4,091	4,522
Tyto tenebricosa	Sooty Owl	249	5,043	5,292
Myotis macropus	Southern Myotis	139	1,175	1,314
Total species credits required		1,188	16,927	18,115

Table 12.3 Summary of total offset credits

Credit type	Early works credit required	Main works credit required	Total credits required
Ecosystem	416	3,573	3,989
Species	1,188	16,927	18,115
Total	1,634	20,500	**22,104**

12.1.1 Staging of offsets

Typically, offset liabilities need to be met before construction commences; however, section 7.14 of the BC Act allows for the staged retirement of credits in line with the stages of development LLP will be seeking to separate offsets for two stages. The proposed timeframe for direct offset delivery is listed in Table 12.4.

The area of each stage and the associated biodiversity credit requirements are yet to be finalised as advice will be required from construction contractors to determine the exact areas required to be disturbed during each phase. However, the areas identified for the early and main works provide a maximum design envelope, in which impacts to biodiversity requiring offsets will happen within.

Table 12.4 Proposed timing and offsetting approach

Stage	Components	Impact	Proposed offset timing
Early works	• Geotechnical drilling and geophysical survey. • Establishing temporary power supply to an early works staging area. • External road upgrades (Magpie Hollow Road and Sir Thomas Mitchell Drive, and respective intersection works). • Establish early works compounds, including a storage area off Sir Thomas Mitchell Drive within existing cleared areas, and a compound at the proposed switchyard location. • Establishment of the workers accommodation camp. • Securing the site using fencing and gates, as required. • Temporarily lowering existing Lake Lyell reservoir.	Direct loss of vegetation and threatened species habitat	As this project is CSSI, LLP is seeking two years from the date of approval to retire credits for early works, with further credits to be secured before any development is carried out that would impact on biodiversity values for main works.
Main works	• Pumped hydro generation components: – upper reservoir – lower reservoir (Lake Lyell) – powerhouse and tunnels – inlet / outlet structures • Transmission connection components: – 330 kV switchyard – 330kV towers and conductors – cable bays, busbars, overhead gantries, voltage and current transformers, control building, communication systems and firefighting equipment • internal site access roads and ancillary facilities • other construction components or works	Direct loss of vegetation and threatened species habitat	LLP is seeking two years from the date of approval to retire credits for main works.

12.2 Objectives of the biodiversity offset strategy

The objectives of the biodiversity offset strategy are to:

- meet the requirements of the NSW Biodiversity Offset Scheme and the EPBC Environmental Offsets Policy (DSEWPaC 2012)
- maximise the benefits to biodiversity values through the offset program
- identify offsets that have additional social, economic and/or environmental co-benefits, particularly for the local environment
- minimise costs to the project.

12.3 Options under the Biodiversity Offsets Scheme

Under the NSW Biodiversity Offsets Scheme, several pathways are available to the proponent to meet the offset obligation arising from the project. These pathways are shown in Plate 12.1. Funding of a biodiversity conservation action is only available for a limited set of species and communities, as set out in the *Ancillary rules: Biodiversity conservation actions* (OEH, 2017); none of these species occur within the construction envelope. The project is not a State Significant Development (SSD) mining project and thus ecological rehabilitation is not available. This means that offsets will need to be provided via retirement of like-for-like credits or payment into the Biodiversity Conservation Fund (BCF).

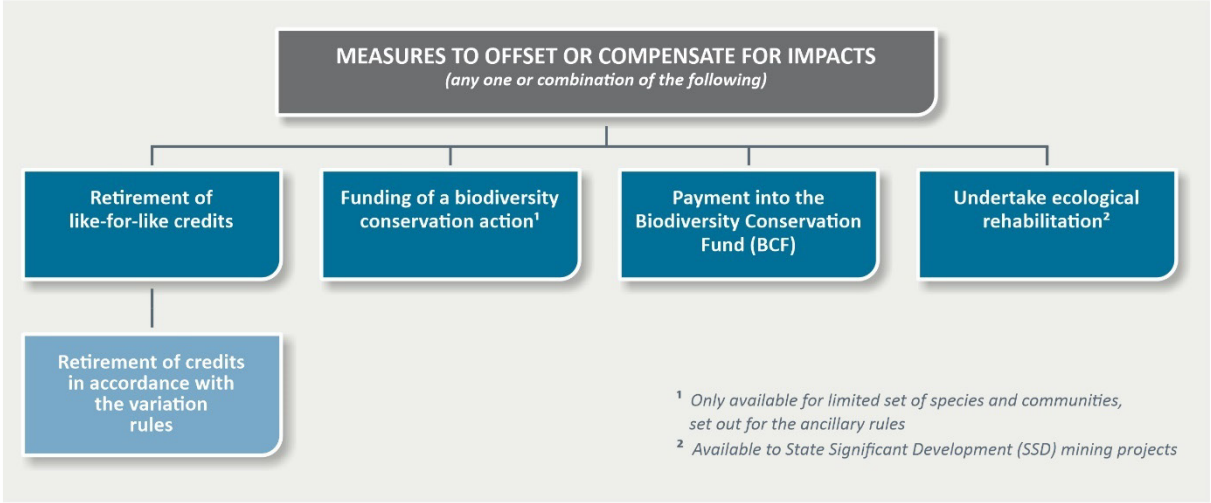


Plate 12.1 NSW Biodiversity Offset Scheme offset options

The various options available to meet the offset requirements of the are discussed below.

12.3.1 Like-for-like credits

i Credits possibly available on the market

A review of existing credits in the market indicates that some credits may be available for some offset trading groups and species. A number of these credits are likely to be currently held by relevant project proponents and hence are likely to be unavailable for purchase. Contact with these credit holders would be required to determine if they are available for purchase.

While there are insufficient credits available to fully meet the offset requirements of the project, many suitable ecosystem credits and some species credits (e.g. Koala, Powerful Owl and Gang-gang Cockatoo) may be available to partially offset impacts of the project. Purchase of credits from the market may be undertaken if there is a shortfall in credits able to be generated through the establishment of one or more stewardship sites or if necessary due to project development timeframes, as detailed in Section12.3.1ii below.

Note that Ecosystem credits need to be sourced from same or adjoining IBRA subregions or a subregion that is within 100 km of the outer edge of the impacted site. This means that Ecosystem credits can be sourced from Bathurst, Hill End, Burragorang, Wollemi, Capertee Uplands, Capertee Valley, Inland Slopes, Kerrabee, Orange, Oberon and Kanangra IBRA subregions. Species credits can be sourced anywhere in NSW.

A review of credits available in the market is provided in Table 12.5.

Table 12.5 Summary of like-for-like credits available to offset impacts of the project

Offset trading group / species	Credits required for early works	Credits required for main works	Credits on market	Percentage of requirement that could be met through credit purchase
Southern Escarpment Wet Sclerophyll Forests <50%	14	195	24 (pending review)	11%
Tableland Clay Grassy Woodlands ≥70% to <90%	119	0	0	0
Southern Tableland Grassy Woodlands ≥70% to <90%	108	418	0	0
Southern Tableland Grassy Woodlands ≥50 to <70%	51	1,061	0	0
Subalpine Woodlands ≥70% to <90%	11	0	0	0
South East Dry Sclerophyll Forests <50%	8	261	402 (pending review)	>100%
Sydney Montane Dry Sclerophyll Forests <50%	2	0	0	0
Southern Tableland Dry Sclerophyll Forests ≥50 to <70%	133	1,638	2,394 (pending review), 47 (issued)	>100%
Gang-Gang Cockatoo	137	2,192	280 (equivalence credits) 156 (pending review)	19%
Glossy Black Cockatoo	4	196	0	0
Powerful Owl	214	3,839	5,406 (issued) 13,084 (pending review) -	>100%
Purple Copper Butterfly (Bathurst Copper Butterfly)	14	391	0	0
Koala	431	4,091	326 (issued) 2,555 (equivalence credits)	64%
Sooty Owl	249	5,043	490 (pending review)	9%
Southern Myotis	139	1,175	3549 (issued) 1,715 (pending review)	>100%

Notes: * including credits available for a higher offset trading group.

Credit availability as of 11 August 2025. This includes credits 'pending review'.

ii Proponent driven offsets

EnergyAustralia owns land containing native vegetation in the project area, outside of the construction envelope, where a Biodiversity Stewardship Agreement (BSA) could be established to generate some of the credits required to offset impacts of the project. This approach would have several benefits:

- surrounding land is most likely to meet the needs of the project by providing the right types of credits. That is, PCTs and species impacted by the project are likely to occur within the land immediately adjacent to the disturbance footprint
- this approach has the additional benefit of protecting land for conservation in perpetuity, which is connected to Marrangaroo National Park, thereby enhancing the protection of adjacent areas of the park
- this approach would provide a local benefit to the environment.

Preliminary assessment based on vegetation within the project area but outside of the construction envelope has been undertaken. This preliminary work has identified that this land is likely to generate some ecosystem credits suitable for the project (refer to Table 12.6).

Lands within the project area are not sufficient to meet the offset requirements of the project, so LLP will consider options for developing BSA sites in other areas, such as land near Thompsons Creek reservoir near Mount Lambie where there are offset sites in operation, and a site known as “Gulf Mountain” in the locality known as Running Steam, north of the Turon River.

Table 12.6 Estimate of ecosystem credit yield from Site 1 - Lake Lyell (land in the project area outside of the construction envelope)

Offset trading group	Credits required	Estimated credits generated	Percentage of offset requirement likely to be met
South East Dry Sclerophyll Forests <50%	269	3	1%
Southern Escarpment Wet Sclerophyll Forests <50%	209	45	22%
Southern Tableland Dry Sclerophyll Forests >=50% and <70%	1,771	786	44%
Southern Tableland Grassy Woodlands >=50% and <70%	1,112	532	48%
Southern Tableland Grassy Woodlands >=70% and <90%	496	359	72%
Subalpine Woodlands >70% and <90%	11	19	173%
Sydney Montane Dry Sclerophyll Forests <50%	2	0	0%
Tableland Clay Grassy Woodlands >=70% and <90%	119	6	5%

Notes: Credits are based upon averaged credit returns.)).

Further detailed assessment of this land is required to provide more confidence in the potential credit yield. This would include vegetation mapping and targeted surveys to confirm presence and extent of threatened species habitat within this land and determine potential species credit yields. Lake Lyell Project Pty Ltd proposes to develop a Biodiversity Stewardship Agreement over this land to offset a proportion of the impacts from the project.

Preliminary assessment has been undertaken on the "Gulf Mountain" site. This preliminary work has identified that this land is likely to generate some ecosystem credits suitable for the project (refer to Table 12.7).

Table 12.7 Estimate of ecosystem credit yield from Site 2 - Gulf Mountain

Offset trading group	Credits required	Estimated credits generated	Percentage of offset requirement likely to be met
South East Dry Sclerophyll Forests <50%	269	0	0%
Southern Escarpment Wet Sclerophyll Forests <50%	209	158	76%
Southern Tableland Dry Sclerophyll Forests >=50% and <70%	1,771	3,710	209%
Southern Tableland Grassy Woodlands >=50% and <70%	1,112	1,679	151%
Southern Tableland Grassy Woodlands >=70% and <90%	496	42	8%
Subalpine Woodlands >70% and <90%	11	0	0%
Sydney Montane Dry Sclerophyll Forests <50%	2	0	0%
Tableland Clay Grassy Woodlands >=70% and <90%	119	103	87%

Notes: Credits are estimated on a conservative assumption that 4 credits would be generated per hectare of land based on the Biodiversity Conservation Fund Charge System Guide to Typical Credit Yield per hectare (BCT 2024).

Further detailed assessment of this land is required to provide more confidence in the potential credit yield. This would include vegetation mapping and targeted surveys to confirm presence and extent of threatened species habitat within this land and determine potential species credit yields. Lake Lyell Project Pty Ltd proposes to develop a Biodiversity Stewardship Agreement over this land to offset a proportion of the impacts from the project.

Together the sites could potentially generate 3,522 of the 3,987 ecosystem credits (88% of total liability) required by the project (refer to Table 12.8).

Table 12.8 Required Credits: comparison of credit generation from both sites against identified Ecosystem Credit Liability

Relevant Offset Trading Groups (OTGs)	Credit generation potential		Total - Potential credit generation	Credit requirement (total)	Required credits potentially generated by both sites	Percentage of project liability[2]	Surplus credits potentially generated by both sites for relevant OTGs
	Site 1: Lake Lyell	Site 2: Gulf Mountain					
South East Dry Sclerophyll Forests <50%	3	0	3	269	3	1%	0
Southern Escarpment Wet Sclerophyll Forests <50%	45	158	203	209	203	97%	0
Southern Tableland Dry Sclerophyll Forests >50 to <70%	786	3710	4,496	1,771	1,771	254%	2,725

Relevant Offset Trading Groups (OTGs)	Credit generation potential		Total - Potential credit generation	Credit requirement (total)	Required credits potentially generated by both sites	Percentage of project liability[2]	Surplus credits potentially generated by both sites for relevant OTGs
	Site 1: Lake Lyell	Site 2: Gulf Mountain					
Southern Tableland Grassy Woodlands >50 to <70%	532	1,679	2,211	1,112	1,112	199%	1,099
Southern Tableland Grassy Woodlands >70% to <90%	359	0	359	496	359 (+ 42)[1]	72% (+ 8%)[1]	0
Southern Tableland Grassy Woodlands; >90%[1]	0	42	42	0	42[1]	8%[1]	0
Subalpine Woodlands >70% to <90%	19	0	19	11	11	173%	8
Tableland Clay Grassy Woodlands >70% to <90%	21	0	21	119	21	18%	0
Totals	**1,765**	**5,589**	**7,354**	**3,987**	**3,522**	**-**	**3,480**

Notes

1. Under the Like-for-like credit trading rules, OTG's in a higher trading class (i.e. higher percentage cleared), can be used to offset obligations in a lower trading class/lower percentage cleared.
2. **Key** to highlighting in the table:
   - Green - Credit requirements for OTG may be met in full
   - Yellow - A large majority of credit requirements for OTG may be met
   - Orange - A relatively small proportion credit requirements for OTG may be met

12.4 Biodiversity Offset Package

Prior to any development being carried out that would impact on biodiversity values, a detailed Biodiversity Offset Package will be prepared that is consistent with this Biodiversity Offset Strategy. The Biodiversity Offset Package will include details of the specific biodiversity offset measures to be implemented and delivered in accordance with the NSW Biodiversity Offset Scheme, including:

- the proposed location/s of proponent driven offset site/s, estimated credit generation, and estimates of any shortfall in credits required that would need to be retired through other means
- the number and type of credits (if any) proposed to be retired through the purchase of credits from the biodiversity offsets market (after confirming credit availability)
- the number of like-for-like credits to be retired for each for each species and offset trading group
- the number and type of credits (if any) proposed to be retired through payment into the BCF and the amount to be paid as calculated in accordance with division 6 of the BC Act
- the timing and responsibilities for the implementation and delivery of the measures required in the Biodiversity Offset Package.

The Biodiversity Offset Strategy outlined herein, and the detailed Biodiversity Offset Package to be developed post-approval will provide certainty that the residual impacts of the project can be adequately offset in accordance with NSW Biodiversity Offset Scheme.

13 Assessment of other relevant legislation

13.1 Environment Protection and Biodiversity Conservation Act 1999

On 3 April 2023, the delegate for the Minister determined that the project was a controlled action under section 75 of the EPBC Act (EPBC 2020/8850). The EPBC Act controlling provisions for the proposed actions are:

- listed threatened species and communities (chapter 18 and section 18A)
- listed migratory species (sections 20 and 20A).

This section addresses potential impacts on EPBC Act listed threatened species and communities, and listed migratory species.

13.1.1 Likelihood of occurrence

i EPBC Act listed threatened ecological communities

TECs listed under the EPBC Act were predicted to occur in the locality based on searches of the EPBC Act Protected Matters Search Tool (PMST) and an assessment of TEC associated with PCTs recorded within the construction envelope. The PMST identified three EPBC Act listed TECs as having potential to occur in the construction envelope:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community
- Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion Endangered Ecological Community
- Natural Temperate Grassland of the South Eastern Highlands Critically Endangered Ecological Community.

An assessment of the likelihood of these TECs occurring within the construction envelope is provided in Table 13.1. Based on this assessment, none of these TECs were found to occur in the construction envelope.

Table 13.1 Assessment of EPBC Act threatened ecological communities known or predicted to occur in the relevant IBRA subregions

TEC name and status	Known or predicted to occur[1]	Key characteristics of TEC as described in the TEC listing advice, conservation advice and identification guidelines	Comparison with vegetation of the construction envelope
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)	Community likely to occur within area	Occurs on hilly to undulating landscapes in areas with soils of moderate fertility derived from a range of lithologies, including alkaline and acid volcanics, granites, sediments, serpentinites and metamorphic rocks. Dominated (or was formerly dominated) by a range of eucalypts, most commonly including *Eucalyptus albens* (white box), *E. melliodora* (yellow box) and/or *E. blakelyi* (Blakely's red gum), and in some areas the grey box species *E. microcarpa* and/or *E. moluccana*. In a mature and relatively undisturbed state, trees have a clearly separated canopy with a projected foliage cover rarely exceeding 30%.	No PCTs in the construction envelope contain White Box or Blakely's Red Gum. Two PCTs in the construction envelope contain Yellow Box; PCT 3348 and PCT 3367. PCT 3348 is dominated by Ribbon Gum (*Eucalyptus viminalis*), a species that is not characteristic of the TEC, with only occasional Yellow Box, and occurs on low fertility sandy soil. PCT 3367 is dominated by a mix of Apple Box (*Eucalyptus bridgesiana*), Candlebark (*Eucalyptus rubida*), Yellow Box and Broad-leaved Peppermint (*Eucalyptus dives*) and occurs on low fertility soil. While Yellow Box occurs in this PCT and may be locally abundant over small areas, it is not consistently a dominant species. Neither PCT 3348 nor PCT 3367 are consistent with the floristic composition and soil characteristics of the TEC.
Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (Endangered)	Community may occur within area	Generally confined to the Sydney Basin IBRA Bioregion although some occurrences may extend outside the Sydney Basin Bioregion boundary. Confined to soils derived from basalt and basalt-like (e.g. microsyenite intrusion) substrates. Typically occurs at elevations between 650 to 1,050 m above sea level (asl), with certain outlying occurrences at lower (to 350 m asl) or higher (above 1200 m asl) elevations. Occurs in areas with a high mean annual rainfall, typically 950 to 1,600 mm/year. The tree canopy layer is present and is dominated by eucalypt trees (most often *Eucalyptus fastigata* (brown barrel), *E. viminalis* (ribbon gum) and *E. radiata subsp. radiata* (narrow-leaved peppermint) and has a minimum canopy cover of 30%. Typically, the ecological community has a sparse to dense layer of shrubs and vines, and a diverse understorey of native grasses, forbs, twiners and ferns.	Several PCTs in the construction envelope contain *Eucalyptus fastigata* and/or *Eucalyptus viminalis*. The soils of the site are of low fertility and derived from metasediments (e.g. quartzite), granite and fine-grained sedimentary rock. There is no basalt, microsyenite or other igneous rock substrate on or adjacent to the construction envelope. None of the PCTs in the construction envelope are on soils derived from basalt or basalt-like (e.g. microsyenite intrusion) substrates that are a defining characteristic of the TEC. Therefore, the TEC does not occur in the construction envelope.

TEC name and status	Known or predicted to occur[1]	Key characteristics of TEC as described in the TEC listing advice, conservation advice and identification guidelines	Comparison with vegetation of the construction envelope
Natural Temperate Grassland of the South Eastern Highlands (Critically Endangered)	Community may occur within area	Occurs on a wide range of topographic positions and on soils derived from a variety of substrates, including granites, basalts, sediments, colluvium and alluvium. A naturally treeless or sparsely treed community characterised by a dominance of native perennial tussock grasses, the tallest stratum of which is typically up to 1.0 m in height. The dominant or co-dominant grasses occur in association with a range of other native herbaceous species, including many forbs and graminoids. In some cases, one or more tree, shrub or sub-shrub species may be present, either as isolated individuals or in small stands, with projective foliage cover less than 10% in each layer.	Vegetation over most of the site consists of forest, woodland or derived shrubland with a cover of woody vegetation well in excess of 10%. In treeless areas, the ground layer is either very clearly dominated by exotic species (much greater than 50% of the cover present) or dominated by a single native grass species *Microlaena stipoides* (Weeping Grass). The areas dominated by Weeping Grass are derived native grasslands and they do not contain at least four non-grass native species, nor any indicator species in BAM plots sampled. No vegetation in the construction envelope is consistent with the TEC.

Notes:

1. Known or predicted to occurrence is based the PMST search result only.

ii Threatened species

The results of the PMST, Biodiversity Assessment Method Calculator (BAM-C) and the Supplementary SEARs predicted that 18 flora species and 28 fauna species listed under the EPBC Act could occur within the construction envelope. The likelihood of occurrence for these flora and fauna species is assessed in Table 13.2 and Table 13.3, respectively.

Table 13.2 Likelihood of occurrence assessment of threatened flora species under the EPBC Act

Name (scientific and common)	Status[3]	Source[1]	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Acacia bynoeana Bynoe's Wattle, Tiny Wattle	V	PMST	No	No	No	No	Negligible. The construction envelope is outside of the species' known distribution. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the construction envelope is located. This species was not recorded during the surveys.

Name (scientific and common)	Status[3]	Source[1]	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Acacia flocktoniae Flockton Wattle	V	BAM-C	No	Yes	No	No	Low. Potential habitat for the species exists on the construction envelope. The very small area of potential habitat (0.05 ha) was thoroughly surveyed as a modified (linear, 80 m x 10 m floristic survey) BAM plot was located in this location.
Acacia meiantha	E	BAM-C	Yes	No	No	No	Low. Potential habitat for the species exists in the construction envelope. This species was not recorded during targeted surveys.
Asterolasia buxifolia	CE	BAM-C	No	Yes	No	No	Negligible. The construction envelope is outside of the species' known distribution. Outside of species PMST modelled distribution. The species is known from a single location, where it is restricted to the riparian vegetation of the River Lett, near Hartley. The associated habitat for the species in the construction envelope (as defined by the combination of an associated PCT and the IBRA subregion) does not contain any riparian vegetation. This species was not recorded during targeted surveys.
Boronia deanei Deane's Boronia	V	BAM-C	No	Yes	Yes	Yes	Low. The construction envelope is outside of the species' known distribution. Habitat for the species includes the margins of high-altitude swamps, stream banks, wet heath and drier open forest on low nutrient, poorly drained peaty soils on sandstone or granite. There are no swamps nor areas of wet heath in the construction envelope. The associated habitat for the species in the construction envelope (as defined by the combination of an associated PCT and the IBRA subregion) does not contain any suitable swamp, heath or forest on poorly drained peaty soils. The species was not recorded during surveys.

Name (scientific and common)	Status[3]	Source[1]	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Caladenia attenuata Duramana Fingers	CE	SEARs	No	No	No	No	Negligible. The site is outside of the species' known distribution and outside of species PMST modelled distribution. It is not associated with any of the PCTs found on the site. It was included in the project scoping report and SEARs based on uncertainty regarding preliminary information. The species has not been recorded within the surrounding area and has a highly restricted recorded distribution. The species was searched for during targeted surveys in spring for other plant species. Several other Caladenia species (*Caladenia mentiens, Caladenia moschata, Caladenia carnea*) were found but none were a match for this species.
Cryptostylis hunteriana Leafless Tongue-orchid	V	PMST	No	No	No	No	Negligible. The site is outside of the species' known distribution. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the site is located. This species was not recorded during the surveys.
Eucalyptus aggregata Black Gum	V	PMST BAM-C	Yes	Yes	Yes	No	Negligible. A small amount of marginal habitat for the species exists in the construction envelope. This species was not recorded during targeted surveys.
Eucalyptus pulverulenta Silver-leaved Mountain Gum, Silver-leaved Gum	V	PMST BAM-C	Yes	Yes	No	No	Low. Potential habitat for the species exists in the construction envelope. Although there is a record of this species within 100 m of the construction envelope from 1995 (Bionet 2025), targeted surveys for this species that included specific searches for the recorded individual failed to detect this species. Note: the record in the construction envelope, was of a single individual and has a reported spatial accuracy of 100 m.
Eucalyptus robertsonii subsp. *hemisphaerica* Robertson's Peppermint	V	BAM-C	Yes	Yes	No	No	Negligible The site is outside of the species' known distribution and outside of species' PMST modelled distribution. This species was not recorded despite targeted survey.

Name (scientific and common)	Status[3]	Source[1]	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Euphrasia arguta	CE	PMST	No	No	No	No	Negligible. The site is outside of the species' known distribution. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the site is located. This species was not recorded during surveys.
Kunzea cambagei Cambage Kunzea	V	PMST	No	No	No	No	Negligible. The site is near the outer limits of the species' known distribution. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the site is located. This species was not recorded during the surveys.
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy	E	PMST BAM-C	Yes	Yes	No	No	Low. Potential habitat for the species exists in the construction envelope. This species was not recorded during targeted surveys.
Persoonia marginata	V	PMST BAM-C	Yes	Yes	Yes	Yes	Low Potential habitat for the species exists in the construction envelope. This species was not recorded during targeted surveys.
Persoonia hindii	E	PMST BAM-C	Yes	Yes	No	Yes	Low Unlikely to occur due to habitat being highly degraded and the species not having been recorded during surveys.
Pomaderris brunnea Rufous Pomaderris, Brown Pomaderris	V	PMST	No	No	No	No	Negligible. The site is near the outer limits of the species' known distribution. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the site is located. This species was not recorded during targeted surveys.

Name (scientific and common)	Status[3]	Source[1]	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Pomaderris cotoneaster Cotoneaster Pomaderris	E	PMST	Yes	Yes	No	No	Low. The site is near the outer limits of the species' known distribution. The species is not associated with both any of the PCTs in the construction envelope and the IBRA subregions in which the site is located. This species was not recorded during targeted surveys.
Rhizanthella slateri Eastern Underground Orchid	E	PMST	No	No	No	No	Negligible. The site is outside of the species' known distribution. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the site is located. This species was not recorded during targeted surveys.
Thesium australe Austral Toadflax	V	PMST	No	Yes	No	No	Low. The species is not associated with the Hill End IBRA subregion in which most of the site is located and is only predicted to occur in the Bathurst IBRA subregion. This species was not recorded during targeted surveys.
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy	V	PMST	No	No	No	No	Negligible. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the site is located. This species was not recorded during targeted surveys.
Zieria obcordata Granite Zieria	E	SEARs	Yes	Yes	No	No	Negligible. The site is well outside of the species' known distribution and PMST modelled distribution. It is not associated with any of the PCTs found in the construction envelope. It was included in the project scoping report and SEARs based on uncertainty regarding preliminary information. This species was not recorded during targeted surveys.

Notes: 1. Sources include:

PMST - indicates that the species was returned from the EPBC Protected Matter Search Tool.

BAM-C - indicates that the species was returned from the BAM Calculator based on the PCTs present and IBRA subregion/s.

SEARs – indicates that the species, although not returned from the BAM-C or PMST was referenced in the SEARs as possibly affected.

2. Species records data from Bionet Atlas of NSW Wildlife and the Atlas of Living Australia

3. V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act.

Table 13.3 Likelihood of occurrence assessment of threatened fauna species under the EPBC Act

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Birds							
Regent Honeyeater *Anthochaera phrygia*	CE	PMST BAM-C	Yes	Yes	No	No	Moderate. Potential habitat, consisting of PCTs associated with the species, was recorded in the construction envelope. The site is not within a mapped area of important habitat for the species and there are few local records. It is unlikely to breed in the construction envelope or regularly forage there but may forage there intermittently. The species was not recorded during surveys.
Southern Whiteface *Aphelocephala leucopsis*	V	PMST	N/A	N/A	No	No	Low. The construction envelope is outside of the typically inland distribution for this species, and it is only likely to occur as a very rare vagrant in the locality. The species has been recorded historically in the locality but has not been recorded in the locality for more than 20 years. The species was not recorded during surveys.
Australasian Bittern *Botaurus poiciloptilus*	E	PMST BAM-C	Yes	Yes	No	No	Negligible. Associated wetland habitats (i.e. tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.), are absent from the construction envelope. There are no records of the species from Lake Lyell vicinity, the nearest record is from about 30 km away from the year 1972. There are only a few other scattered records from within 50 km, none of which are dated.
Curlew Sandpiper *Calidris ferruginea*	CE, M	PMST	No	Yes	No	No	Low. This species is predominantly a shorebird of coastal wetlands but also occurs sporadically and infrequently around inland waterbodies. The species may occur very infrequently around the shores of Lake Lyell but has not been recorded there or nearby.
Sharp-tailed Sandpiper *Calidris acuminata*	V, M	PMST	N/A	N/A	No	No	Moderate. This species is recorded in near coastal and inland wetlands and has been recorded locally at Lithgow wastewater treatment plant. The species may occur occasionally around the shores of Lake Lyell but has not been recorded there.

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Gang-gang Cockatoo *Callocephalon fimbriatum*	E	PMST BAM-C	Yes	Yes	Yes	No	Known. Recorded on site.
South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami lathami*	V	PMST BAM-C	Yes	Yes	No	Yes	Known. Recorded on site.
Brown Treecreeper (south-eastern) *Climacteris picumnus victoriae*	V	PMST BAM-C	Yes	Yes	Yes	Yes	Moderate. Potential habitat was recorded in the construction envelope. The species was not recorded during surveys. It was recorded south of Lithgow as recently as 2021 and around Lidsdale as recently as 2012.
Grey Falcon *Falco hypoleucos*	V	PMST	No	No	No	No	Low. The construction envelope is outside of the typically inland distribution for this species, and it is only likely to occur as a very rare vagrant in the locality. The species was not recorded during surveys.
Latham's Snipe *Gallinago hardwickii*	V, M	PMST	N/A	N/A	No	No	High. This species has previously been recorded around the shores of Lake Lyell and is likely to occur there intermittently.
Painted Honeyeater *Grantiella picta*	V	PMST BAM-C	Yes	Yes	No	Yes	Moderate. Marginal potential habitat was recorded in the construction envelope. The species was not recorded during surveys. It was recorded south of Lithgow in 2014 and around Lidsdale in 2005. It is unlikely to breed in the construction envelope or regularly forage there but may forage there intermittently.
White-throated Needletail *Hirundapus caudacutus*	V, M	PMST BAM-C	Yes	Yes	Yes	Yes	Moderate. This species is mainly an aerial species and is likely to fly over the construction envelope.

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Swift Parrot *Lathamus discolor*	CE	PMST BAM-C	Yes	Yes	Yes	Yes	Moderate. Potential habitat, consisting of PCTs associated with the species, was recorded in the construction envelope. The site is not within a mapped area of important habitat for the species and there are few local records. It is unlikely to breed in the construction envelope or regularly forage there but may forage there intermittently. The species was not recorded during surveys.
Hooded Robin (south-eastern subspecies) *Melanodryas cucullata cucullata*	E	PMST BAM-C	Yes	Yes	Yes	No	Moderate. Potential habitat was recorded in the construction envelope. The species was not recorded during surveys. It was recorded in Lithgow in 2009 and 2014 and as recently as 2016 around Lidsdale.
Blue-winged Parrot *Neophema chrysostoma*	V	PMST	No	No	No	No	Negligible. The construction envelope is outside of the typically inland and southern distribution for this species in NSW, and it is only likely to occur as a very rare vagrant in the locality. The species is not associated with both a PCT in the construction envelope and the IBRA subregions in which the site is located. The species was not recorded during surveys.
Superb Parrot *Polytelis swainsonii*	V	PMST BAM-C	Yes	Yes	No	No	Moderate to Low. The construction envelope is well outside of the more inland distribution of this species, with only scattered records in the locality, some of which are likely to be attributable to escaped pets. It is only likely to occur as an occasional visitor in the locality. The species was not recorded during surveys and is unlikely to breed in the construction envelope.

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Pilotbird *Pycnoptilus floccosus*	V	PMST	N/A	N/A	Yes	Yes	Low. Pilotbirds are strictly terrestrial, living on the ground in dense forests with heavy undergrowth (DCCEEW 2025c). The site is near the outer limits of the species' known distribution. It was recorded nearby at Hassans Wall Reserve, as recently as 2022. Habitat in the construction envelope is unsuitable due to a general lack of dense undergrowth. The only areas with dense undergrowth in the construction footprint comprise patches of blackberry in several gullies. This species was not recorded during targeted surveys.
Australian Painted Snipe *Rostratula australis*	E	PMST	Yes	Yes	No	No	Low. This species is recorded in near coastal and inland wetlands but has not been recorded locally. The species may occur very infrequently around the shores of Lake Lyell but has not been recorded there.
Diamond Firetail *Stagonopleura guttata*	V	PMST BAM-C	Yes	Yes	Yes	No	High. Potential habitat was recorded in the construction envelope. The species was not recorded during surveys. It was recorded on Sir Thomas Mitchell Drive in 2009, in Lithgow as recently as 2014 and around Lidsdale in 2023.
Mammals							
Large-eared Pied Bat *Chalinolobus dwyeri*	V	PMST BAM-C	Yes	Yes	Yes	Yes	Low. Potential foraging habitat was recorded in the construction envelope and marginal potential roosting habitat is found nearby. There are many records to the north and east of the Great Western Highway but none to the south-west, in forests contiguous with those of the construction envelope. The species was specifically targeted during surveys but was not recorded.
Spotted-tailed Quoll *Dasyurus maculatus*	E	PMST BAM-C	Yes	Yes	Yes	Yes	Moderate. Potential habitat was recorded in the construction envelope. The species was not specifically targeted and was not recorded incidentally during surveys. It was recorded north of Lithgow in 2019, and near Hartley as recently as 2021.

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Greater Glider *Petauroides volans*	E	PMST BAM-C	Yes	Yes	No	Yes	Low. Potential habitat was recorded in the construction envelope. There are many records to the north and east of the Great Western Highway but none to the south-west, in forests contiguous with those of the construction envelope. The species was specifically targeted during surveys but was not recorded.
Yellow-bellied Glider *Petaurus australis australis*	V	PMST BAM-C	Yes	Yes	Yes	Yes	Moderate Potential habitat was recorded in the construction envelope. It was recorded north of Lithgow as recently as 1999 and around Lidsdale in 2019. The species was specifically targeted during surveys but was not recorded. It is unlikely to currently occupy the construction envelope but is moderately likely to occur there intermittently.
Brush-tailed Rock-wallaby *Petrogale penicillata*	V	PMST BAM-C	No	Yes	No	Yes	Negligible. The species is not associated with the Hill End IBRA subregion in which most of the site is located. It is associated with the Bathurst IBRA subregion however the only potential habitat in the construction envelope in this region consists of narrow strips of woodland and forest immediately adjacent to Sir Thomas Mitchell Drive, which do not contain any potential rocky shelter sites. No potential habitat was recorded in the construction envelope. There are many records to the north and east of the Great Western Highway in the Newnes and Glen Davis areas but none to the south-west, in forests contiguous with those of the construction envelope. There are historical records from around Lithgow. The species was not specifically targeted during surveys nor was it incidentally recorded.
Koala *Phascolarctos cinereus*	E	PMST BAM-C	Yes	Yes	Yes	Yes	Recorded. The construction envelope contains suitable forested habitat for the species. There are records from the locality, mostly from 2017 to 2019 with one record from south of Lithgow from 2022. Surveys of the site in accordance with BAM survey guidelines detected the species via a Koala detection dog survey. Koala scats were found near the upper reservoir site. The species is assumed to occur at low density throughout woodland and forest in the construction envelope.

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
New Holland Mouse *Pseudomys novae-hollandiae*	V	PMST	No	No	No	No	Low. The construction envelope is near the outer limits of the species' known distribution. The construction envelope does not contain suitable habitat for the species since the preferred habitat is absent, with open heathlands, open woodlands with a heathland understorey and vegetated sand dunes absent.
Grey-headed Flying-fox *Pteropus poliocephalus*	V	PMST BAM-C	Yes	Yes	Yes	Yes	High. This species has been recorded in the locality but was not recorded in the construction envelope. It is likely to forage on flowering eucalypts in the construction envelope intermittently, in response to temporal variation in flowering due to climatic variation. The nearest camp site for Grey-headed Flying-fox is in Bathurst, approximately 50 km from the construction envelope (DCCEEW 2024). No evidence of breeding camps was observed in the construction envelope.
Frogs							
Yellow-spotted Bell Frog, Yellow-spotted Tree Frog *Litoria castanea*	CE	BAM-C	Yes	Yes	No	No	Low. Associated habitat consisting of swamp, semi-permanent / ephemeral wet areas are absent from the construction envelope. Very little emergent aquatic vegetation is found along the periphery of Lake Lyell, due in part to its typically steep banks. The reservoir contains a variety of predatory exotic fish such as Rainbow Trout and Redfin Perch and is unlikely to be suitable as habitat. The construction envelope is outside of the species' known or predicted distribution; it is outside of the expert distribution 'maybe' and 'likely' distribution areas by approximately 27 km (ALA 2025). The nearest record of the species is more than 30 km from the construction envelope (ALA 2025).

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Green and Golden Bell Frog *Litoria aurea*	V	BAM-C	Yes	Yes	No	No	Low. Associated habitat consisting of swamp, semi-permanent/ephemeral wet areas are absent from the construction envelope. Very little emergent aquatic vegetation is found along the periphery of Lake Lyell. The reservoir contains a variety of predatory exotic fish such as Rainbow Trout and Redfin Perch and is unlikely to be suitable as habitat. The construction envelope is outside of the species' known or predicted distribution; it is outside of the expert distribution 'maybe' distribution by about 28 km and 'likely' distribution areas by approximately 46 km (ALA 2025). The nearest record of the species is more than 30 km from the construction envelope (ALA 2025).
Southern Bell Frog *Litoria raniformis*	V	BAM-C	No	Yes	No	No	Low. Preferred habitat consisting of swamp, semi-permanent/ephemeral wet areas are absent from the construction envelope. Very little emergent aquatic vegetation is found along the periphery of Lake Lyell. The reservoir contains a variety of predatory exotic fish such as Rainbow Trout and Redfin Perch and is unlikely to be suitable as habitat. The nearest spatially-accurate (accuracy of less than 10 km) record of the species is from approximately 30 km to the south-west and from 1975. The construction envelope is outside of the species' known or predicted distribution; it is outside of the expert distribution 'maybe' area by about 70 km and 'likely' distribution areas by about 270 km (ALA 2025).

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Booroolong Frog *Litoria booroolongensis*	E	PMST BAM-C	Yes	Yes	No	No	Low. There is no potential habitat for the species within the construction envelope. Some potential habitat is located upstream of the construction envelope within parts of Coxs River and Farmers Creek. That is, the areas of waterway within the project area are inundated by Lake Lyell and does not contain suitable flowing rocky stream habitat. The only possibly suitable habitat is separated from the disturbance footprint by a ridgeline, and a distance of at least approximately 50 m. Hence, there is not expected to be an impact on the species as any potential impact would occur downstream of potential habitat for the species, in an area that is inundated by Lake Lyell and hence unlikely to support the species.
Stuttering Frog *Mixophyes balbus*	E	BAM-C	No	Yes	Yes	No	Negligible. The Stuttering Frog is typically associated with creeks and streams in temperate and sub-tropical rainforest, wet sclerophyll forest and Antarctic Beech forests on the eastern side of the Great Dividing Range. It has been less commonly recorded in dry open riparian vegetation and moist gullies in dry forests in tableland regions of NSW. Aquatic habitat in the Project Envelope is considered unsuitable for the species. That is, the species is not predicted or known from the Hill End IBRA subregion where most of the project area is located. Although the species is predicted in the Bathurst IBRA subregion, there are no suitable waterways in the extent of the project area within this subregion.

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Reptiles							
Pink-tailed Legless Lizard *Aprasia parapulchella*	V	PMST BAM-C	Yes	Yes	No	No	Low The Pink-tailed Legless Lizard habitat includes primary and secondary grassland, grassy woodland and woodland communities, and the species usually inhabits sloping sites that contain rocky outcrops or scattered, partially buried rocks (TSSC 2015a). The structurally intact areas of habitat in the construction envelope are considered marginal based on their open forest structure with relatively high canopy cover as opposed to the grassland or open grassy woodland structure associated with the species. Derived native grassland and exotic grassland areas in the construction envelope (roadsides and highly modified native and exotic grasslands) are likely derived from forest with relatively dense canopy cover, contain very few rocks, are in many areas physically disturbed, and are also at best marginal as habitat. The construction envelope is outside of the species' known distribution The nearest recorded location of the species is more than 40 km north-west of the construction envelope (ALA 2025). Based on the Species of National Environmental Significance (public grids), the construction envelope is within the species' predicted (likely to occur) distribution (DCCEEW 2025). The construction envelope is entirely within approximately 5 to 12 km of the eastern edge of the 'likely to occur' area (DCCEEW 2025). It should be noted that the 'likely to occur' area is generalised to a 10 km resolution and appears to be a very conservative model, including some areas that are more than 150 km from the nearest recorded location of the species (DCCEEW 2025, ALA 2025). Despite the low likelihood that the species could occur in the locality, substantial survey effort was expended and the species was not detected. Surveys were undertaken on 13 occasions, by 1 to 4 ecologists, turning rocks. A total of 3,085 rocks were turned, while searching for the Pink-tailed Legless Lizard during the species survey season and the species was not found.

Name (common and scientific)	Status	Source *	Associated with PCT/s in the construction envelope in an associated IBRA subregion				Likelihood of occurrence in the construction envelope[2]
			IBRA – Hill End	IBRA – Bathurst	IBRA – Buragorang	IBRA – Wollemi	
Striped Legless Lizard *Delma impar*	V	BAM-C	No	Yes	No	No	Low. The construction envelope is outside of the species' known or predicted distribution; it is outside of the expert distribution 'maybe' and 'likely' distribution areas by approximately 100 km. The nearest record of the species is more than 130 km from the construction envelope. The species is not associated with the Hill End IBRA subregion. The Striped Legless Lizard is a grassland specialist. Potential habitat for the Striped Legless Lizard includes all areas which have, or once had, native grasslands or grassy woodlands (including derived grasslands) across the historical range of the species, provided that area retains suitable tussock structure, the soil is of appropriate type and structure, and the site has not had major disturbance (DCCEEW 2025c).
Bathurst Grassland Earless Dragon *Tympanocryptis mccartneyi*	CE	BAM-C	Yes	Yes	No	No	Low. Most of the construction envelope is heavily wooded and unsuitable for this grassland specialist. There is no evidence to suggest that any area of the construction envelope, including derived grassland areas, contains any naturally very open (<5% natural tree cover) native vegetation. construction envelope does not contain any suitable habitat for the species.
Insects							
Purple Copper Butterfly (Bathurst Copper Butterfly) *Paralucia spinifera*	V	PMST BAM-C	Yes	Yes	Yes	Yes	Moderate to High. Potential habitat was recorded in the construction envelope, however, due to a lack of recent fire or other forms of disturbance, this habitat is likely to be marginal for the species at present. The species was not recorded in the construction envelope recorded during surveys but was recorded in a regularly slashed powerline easement approximately 300 m from the construction envelope in Marrangaroo National Park.

Notes: 1. Sources include:

PMST - indicates that the species was returned from the EPBC Protected Matter Search Tool.

BAM-C - indicates that the species was returned from the BAM Calculator based on the PCTs present and IBRA subregion/s.

SEARs – indicates that the species, although not returned from the BAM-C or PMST was referenced in the SEARs as possibly affected.

2. Species records data from Bionet Atlas of NSW Wildlife and the Atlas of Living Australia.

3. M = Migratory, V = Vulnerable, E = Endangered, CE = Critically Endangered under the EPBC Act.

Three EPBC Act listed threatened fauna species were recorded within the construction envelope. These include:

- Koala
- Gang-gang Cockatoo
- South-eastern Glossy Black-Cockatoo.

An additional 13 EPBC Act listed threatened fauna species are considered to have a moderate to high chance of utilising habitat with the construction envelope:

- Grey-headed Flying-fox (foraging only)
- Purple Copper Butterfly (Bathurst Copper Butterfly)
- Spotted-tailed Quoll
- Diamond Firetail
- South-eastern Hooded Robin
- Superb Parrot (foraging only)
- Swift Parrot (foraging only)
- White-throated Needletail (foraging only)
- Painted Honeyeater (foraging only)
- Latham's Snipe (foraging only)
- Brown Treecreeper
- Sharp-tailed Sandpiper (foraging only)
- Regent Honeyeater (foraging only).

These species are discussed further in Section 13.1.

iii Migratory species

Eleven species listed as migratory under the EPBC Act were predicted to occur in the construction envelope based on database searches undertaken. No migratory species were observed in the construction envelope. Table 13.4 provides an assessment of the likelihood of these species using the habitat within the construction envelope.

Table 13.4 Likelihood of occurrence for migratory species

Name (common and scientific)	Status	Source	Likelihood of occurrence
Black-faced Monarch *Monarcha melanopsis*	Migratory	PMST	Moderate. Marginal potential habitat was recorded in the construction envelope. This species has been recorded in the Lithgow and Lidsdale areas and may pass through the site infrequently during migration.
Common Sandpiper *Actitis hypoleucos*	Migratory	PMST	Low. This species is predominantly a shorebird of coastal wetlands but also occurs sporadically and infrequently around inland waterbodies. The species may occur very infrequently around the shores of Lake Lyell but has not been recorded there or nearby.
Curlew Sandpiper *Calidris ferruginea*	Critically Endangered, Migratory	PMST	Low. This species is predominantly a shorebird of coastal wetlands but also occurs sporadically and infrequently around inland waterbodies. The species may occur very infrequently around the shores of Lake Lyell but has not been recorded there or nearby.
Fork-tailed Swift *Apus pacificus*	Migratory	PMST	Moderate. This species is mainly an aerial species and is likely to fly over the construction envelope.
Latham's Snipe *Gallinago hardwickii*	Vulnerable, Migratory	PMST	High. As above in Table 13.3.
Pectoral Sandpiper *Calidris melanotos*	Migratory	PMST	Low. This species is predominantly a shorebird of coastal wetlands but also occurs sporadically and infrequently around inland waterbodies. The species may occur very infrequently around the shores of Lake Lyell but has not been recorded there or nearby.
Rufous Fantail *Rhipidura rufifrons*	Migratory	PMST	Moderate. Marginal potential habitat was recorded in the construction envelope. This species has been recorded in the Lithgow and Wallerawang areas and may pass through the site infrequently during migration.
Satin Flycatcher *Myiagra cyanoleuca*	Migratory	PMST	Moderate. Marginal potential habitat was recorded in the construction envelope. This species has been recorded in the Lithgow and Mount Lambie areas and may pass through the site infrequently during migration.
Sharp-tailed Sandpiper *Calidris acuminata*	Vulnerable, Migratory	PMST	Moderate. As above Table 13.3.
White-throated Needletail *Hirundapus caudacutus*	Vulnerable, Migratory	PMST	Moderate. As above in Table 13.3.
Yellow Wagtail *Motacilla flava*	Migratory	PMST	Low. This species is predominantly recorded near coastal wetlands but also occurs sporadically and infrequently around inland waterbodies. The species may occur very infrequently around the shores of Lake Lyell but has not been recorded there or anywhere nearby.

Seven listed migratory species under the EPBC Act have a moderate or greater likelihood of occurring, which are:

- Black-faced Monarch
- Fork-tailed Swift
- Latham's Snipe
- Rufous Fantail
- Satin Flycatcher
- Sharp-tailed Sandpiper
- White-throated Needletail.

13.1.2 Known or potential occurrence and habitat of EPBC Act listed threatened species

The EPBC Act listed threatened species that had a moderate or greater likelihood of occurring in the project area, and the amount of habitat likely to be affected by the project, are described in Table 13.5.

Table 13.5 Known or potential occurrence and habitat of EPBC Act listed threatened species in the construction envelope

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Anthochaera phrygia	Regent Honeyeater	Yes	Yes	3367 PCT 3348 is not associated with the species but is considered by the authors to be suitable habitat where it occurs within the species' range.	Important habitats, requiring species-specific offsets, are defined by the species' Important Habitat Map. All other areas of woody native vegetation of the associated PCT is considered to be potential foraging habitat.	Not recorded in construction envelope either during surveys for this report or historically. The construction envelope is not within nor near areas covered by the BAM Important Habitat Map for the Regent Honeyeater. May forage on site sporadically but is unlikely to frequently utilise resources or to breed within the construction envelope. All woodland habitat, shrubland and derived grassland with scattered shrubs or trees in the associated PCT is considered potential foraging habitat for this species. Exotic, DEGH and DNG_Poor vegetation zones are considered unlikely to provide habitat for this species since these zones contain minimal native woody vegetation that may provide food resources and/or shelter.	15.72 ha of associated PCTs

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Calidris acuminata	Sharp-tailed Sandpiper	N/A	N/A	No PCT association in the TBDC. Habitat includes muddy edges of lagoons, swamps, lakes, pools, dams, waterholes, soaks, bore drains and saltpans with inundated or emergent vegetation. They also use flooded paddocks, sedgelands and other ephemeral wetlands (DCCEEW 2024a).	N/A	Not recorded in construction envelope during surveys for this report nor historically The sedgeland vegetation in the construction envelope is poorly drained but sloping and unlikely to hold water for extended periods. It is also very dense and unlikely to be suitable for foraging. This species is recorded in near coastal and inland wetlands and has been recorded locally at Lithgow Wastewater Treatment Plant. The species may occur occasionally around the shores of Lake Lyell but has not been recorded there. Only a narrow band of open bare foraging habitat (<50 m^2) at the edge of Lake Lyell was apparent in the construction envelope, immediately adjacent to vegetation zone 3347_DEGH during surveys for the project. However, larger areas of potential habitat may be exposed when water levels in the reservoir are lower.	0 ha There is unlikely to be a net reduction in habitat availability for the species as fluctuating water levels from the project and restoration works are likely to increase habitat availability.

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Callocephalon fimbriatum	Gang-gang Cockatoo	Yes	Yes	3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747	Potential breeding habitat is defined as vegetation of associated PCTs containing hollow bearing trees - Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger. Actual breeding habitat, requiring species-specific offsets according to the BAM, is defined as potential habitat within a 200 m radius of observations of breeding activity. All other areas of woody native vegetation of associated PCTs are considered to be foraging habitat for this species.	Recorded in construction envelope. Foraging and breeding behaviours observed. All woodland habitat, shrubland and derived grassland with scattered shrubs or trees in associated PCTs is considered potential foraging habitat for this species. Exotic, DEGH and DNG_Poor vegetation zones are considered unlikely to provide habitat for this species since these zones contain minimal native woody vegetation that may provide food resources and/or shelter.	101.35 ha overall including 50.09 ha of likely breeding habitat as defined under BAM.

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Calyptorhynchus lathami lathami	South-eastern Glossy Black-Cockatoo	Yes	Yes	3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747	Potential breeding habitat is defined as vegetation of associated PCTs containing hollow bearing trees - Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground. Actual breeding habitat, requiring species-specific offsets under the BAM, is defined as potential habitat within a 200 m radius of observations of breeding activity. Potential foraging habitat is defined as vegetation of associated PCTs containing Allocasuarina and Casuarina species.	Recorded in construction envelope. Foraging and possible breeding behaviours observed. Potential habitat considered to include all associated PCTs except for areas of exotic grassland and poor condition derived native grassland. Most potential habitat in the construction envelope contains a very low density of preferred food species (Allocasuarina and Casuarina) with the exception of an area of PCTs 3369, 3650, 3747 and 3735 covering 3.62 ha where the species was observed foraging.	101.35 ha of associated PCTs including: • 3.62 ha of high quality (high Allocasuarina species density) foraging habitat, and • 2.79 ha of likely breeding habitat as defined under BAM.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Yes	Yes	3211, 3348, 3367, 3369, 3650, 3735, 3747	None	Not recorded in construction envelope during surveys for this report. There is a record of low spatial precision from "Lake Lyell" from 2015. May occur sporadically in the construction envelope but is unlikely to frequently utilise the habitat or to breed there at present given the lack of records during surveys for this report. All woodland habitat in associated PCTs is considered potential foraging habitat for this species. Exotic, DEGH and DNG_Poor vegetation zones are considered unlikely to provide habitat for this species since these zones contain minimal native woody vegetation that may provide food resources and/or shelter.	101.35 ha of associated PCTs

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Dasyurus maculatus	Spotted-tailed Quoll	Yes	Yes	3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747	-	Not recorded in construction envelope during surveys for this report nor historically. May occur sporadically in the construction envelope but is unlikely to frequently utilise the site or to breed there at present given the lack of records during surveys for this report.. All woodland habitat in associated PCTs is considered potential foraging habitat for this species. Exotic, DEGH and DNG_Poor vegetation zones are considered unlikely to provide habitat for this species since these zones contain minimal native woody vegetation that may provide food resources and/or shelter.	101.35 ha of associated PCTs

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Gallinago hardwickii	Latham's Snipe	N/A	N/A	No PCT association in the TBDC. Habitat includes permanent and ephemeral wetlands up to 2,000 m above sea-level – typically open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). They can also occur in modified or artificial habitats, and in habitats located close to human activity (DCCEEW 2024a).	N/A	Not recorded in construction envelope but has been recorded in the project area as single individuals in 2012 and 2018. The only areas of low dense vegetation in the construction envelope adjacent to Lake Lyell are found: • on Collits Swamp Creek, in the vegetation zone 3347_Sedge, which consists of a gently sloped, poorly drained area with dense a groundcover layer heavily dominated by a single species of native sedge, *Carex appressa* (Tall Sedge). Despite recent rainfall at the time of the surveys, the ground surface was not wet in this area, is sloped and it does not appear to hold water for anything but very brief periods. It is considered marginal as habitat for the species • on Farmers Creek, in the vegetation zone 3347_DEGH) which consists of a flat to gently sloping area, with a dense exotic shrub layer consisting of *Rubus fruticosus* species complex (Blackberry) and a few small open areas and consisting of a mix of native and exotic grasses and forbs. Only a narrow band of open bare foraging habitat (<50 m^2) at the edge of Lake Lyell was apparent in the construction envelope, immediately adjacent to vegetation zone 3347_DEGH during surveys for the project. However, larger areas of potential habitat may be exposed when water levels in the reservoir are lower.	0 ha There is unlikely to be a net reduction in habitat availability for the species as fluctuating water levels from the project and restoration works are likely to increase habitat availability.

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Grantiella picta	Painted Honeyeater	Yes	Yes	3211, 3367, 3369, 3650, 3735, 3747 PCT 3348 is not associated with the species but is considered by the authors to be suitable habitat where it occurs within the species' range.	Mistletoes present at a density of greater than five mistletoes per hectare	Not recorded in construction envelope during surveys for this report nor historically. May occur sporadically in the construction envelope but is unlikely to frequently utilise the site or to breed there at present based on the very low frequency of records of the species in the locality. Moderate and Poor condition vegetation zones of PCT 3367 and PCT 3348 contain areas with mistletoes at a density of greater than five mistletoes per hectare and hence were considered as suitable habitat for this species. Excluded from Exotic, Shrubland, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and associated mistletoe.	70.41 ha of associated PCTs including: • 48.06 ha of Moderate and Poor condition vegetation zones of PCT 3367 and 3348.
Hirundapus caudacutus	White-throated Needletail	Yes	Yes	3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747	-	Not recorded in construction envelope during surveys for this report nor historically. May occur sporadically in the construction envelope but is unlikely to frequently utilise the site. The species is migratory and so does not breed in Australia. As an aerial feeder, native vegetation across the entire project area represents potential foraging habitat. Excluded from Exotic, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and only a very low diversity of disturbance-tolerant native ground layer plants. They are unlikely to have any greater value to the species than cleared land and modification to these areas would have negligible impact on the species.	101.35 ha of associated PCTs

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Lathamus discolor	Swift Parrot	Yes	Yes	3347, 3348, 3367, 3369, 3650, 3735, 3747	Important habitats, requiring species-specific offsets, are defined by the species' Important Habitat Map. All other areas of woody native vegetation of the associated PCT is considered to be potential foraging habitat.	Not recorded in construction envelope during surveys for this report nor historically. The construction envelope is not within nor near areas covered by the BAM Important Habitat Map for Swift Parrot. This species may forage sporadically within wooded vegetation zones, particularly those offering winter flowering Eucalyptus spp. The species is migratory and does not breed in mainland Australia.	64.72 ha of High, Moderate and Poor condition vegetation zones of associated PCTs.
Melanodryas cucullata cucullata	South-eastern Hooded Robin	Yes	Yes	3211, 3367, 3369, 3650, 3735, 3747 PCT 3348 is not associated with the species but is considered by the authors to be suitable habitat where it occurs within the species' range.	-	Not recorded in construction envelope during surveys for this report nor historically. May occur sporadically in the construction envelope but is unlikely to frequently utilise the site or to breed there. Excluded from Exotic, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and only a very low diversity of disturbance-tolerant native ground layer plants. They are unlikely to have any greater value to the species than cleared land and modification to these areas would have negligible impact on the species. Included elsewhere.	101.35 ha of associated PCTs
Paralucia spinifera	Purple Copper Butterfly	Yes	Yes	3347, 3348, 3367, 3369, 3650, 3735, 3747	*Bursaria spinosa* or within 40m of *Bursaria spinosa* Above 800 m altitude.	Recorded adjacent to construction envelope. Not recorded on construction envelope but this species was recorded within approximately 300 m of the construction envelope Given this species depends upon *Bursaria spinosa* host plant, which proliferates after disturbance such as fire, it was assumed that suitable habitat may at times be present in areas with a moderate to high density of *Bursaria spinosa* above 800 m altitude that were not intensively surveyed during ideal conditions.	9.3 ha

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Petaurus australis	Yellow-bellied Glider	Yes	-	3211, 3650, 3735	-	Not recorded in construction envelope during surveys for this report nor historically. May occur sporadically in the construction envelope but is unlikely to frequently utilise the site or to breed there at present.	51.6 ha of associated PCTs
Phascolarctos cinereus	Koala	Yes	Yes	3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747	Presence of koala use trees as defined in the "Koala (*Phascolarctos cinereus*): Biodiversity Assessment Method Survey Guide for information on targeted survey requirements and mapping species polygons".	Recorded in construction envelope during surveys for this report. Assumed to occur in all treed areas of the construction envelope, excluding a single small area of exotic pines (Pinus sp.) and scattered Silver Wattle (*Acacia dealbata*) and overhanging branches of eucalypts in the Town camp site.	99.31 ha of associated PCTs containing feed trees (eucalypts).
Polytelis swainsonii	Superb Parrot	Yes	Yes	3367, 3369, 3735 PCT 3348 is not associated with the species but is considered by the authors to be suitable habitat where it occurs within the species' range.	Potential breeding habitat is defined as vegetation of associated PCTs containing - Living or dead E. *blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta* with hollows greater than 5 cm diameter; greater than 4 m above ground or trees with a DBH of greater than 30 cm.	Not recorded in construction envelope during surveys for this report nor historically. Species considered to be a vagrant in the region and not seen on site at all during bird surveys. Only likely to forage occasionally and sporadically in the construction envelope. Excluded from Exotic, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and only a very low diversity of disturbance-tolerant native ground layer plants. They are unlikely to have any greater value to the species than cleared land and modification to these areas would have negligible impact on the species. Included elsewhere.	77.25 of associated PCTs that may be used sporadically and infrequently by vagrant birds.

Scientific name	Common name	Associated with PCT/s and IBRA subregion/s in TBDC		Associated PCTs in TBDC and other habitats	Habitat and geographic constraints as defined under the BAM	Known or potential occurrence in construction envelope	Area of known or potential habitat impacted (ha)
		Hill End	Bathurst				
Pteropus poliocephalus	Grey-headed Flying-fox	Yes	Yes	3211, 3347, 3348, 3367, 3369, 3735, 3747 PCT 3650 is not associated with the species but is considered by the authors to be suitable habitat where it occurs within the species' range.	Breeding habitats, requiring species-specific offsets, are defined by the presence of breeding camps.	Not recorded in construction envelope during surveys for this report nor historically There is no breeding camp within the project area. Foraging habitat only is expected within the project area. Foraging habitat was assumed to be all vegetation zones containing trees. Exotic, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation.	101.35 ha of associated PCTs
Stagonopleura guttata	Diamond Firetail	Yes	Yes	3211, 3347, 3348, 3367, 3369, 3650, 3735, 3747	-	Not recorded in construction envelope during surveys for this report but recorded on Sir Thomas Mitchell Drive in 2009. Excluded from Exotic, DEGH and DNG_Poor vegetation zones as these zones contain minimal native woody vegetation and only a very low diversity of disturbance-tolerant native ground layer plants. They are unlikely to have any greater value to the species than cleared land and modification to these areas would have negligible impact on the species. Included elsewhere.	101.35 ha of associated PCTs

Notes: PCT = Plant Community Type as defined by the NSW BioNet Vegetation Classification.

TBDC = - Bionet Threatened Biodiversity Data Collection.

IBRA = Interim Biogeographic Regionalisation for Australia

DNG = Derived Native Grassland

DEGH = Derived Exotic Grassland or Herbfield.

13.2 Impact significance assessments

The following section provides assessments of significance for the threatened flora and fauna and migratory species known or considered to have a moderate or greater likelihood of utilising the construction envelope. These assessments of significance were prepared in accordance with the MNES Significant Impact Guidelines 1.1 (DEWHA 2013).

The definition of a significant impact was applied as per the EPBC Act Significant Impact Guidelines 1.1, which defines a "likely significant impact" as:

"*To be 'likely', it is not necessary for a significant impact to have a greater than 50% chance of happening; it is sufficient if a significant impact on the environment is a real or not remote chance or possibility*."

As such, impacts considered likely or possible to occur were considered to likely be a significant impact. Further, if there was scientific uncertainty about the impacts of the project and potential impacts are serious or irreversible, the precautionary principle was applied.

13.2.1 Assessment of significance: Regent Honeyeater and Swift Parrot (EPBC Act: Critically Endangered)

Table 13.6 Regent Honeyeater (Critically Endangered)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	**Unlikely.** The project would result in the removal of potential foraging habitat for the Regent Honeyeater comprising 15.72 ha of grassy woodland and forest belonging to PCTs 3367 and 3348. Regent Honeyeater primarily forage on nectar from eucalypts and mistletoes within such vegetation communities, however, on occasion forage on invertebrates, exudates and fruit (DoE 2016). Regent Honeyeaters comprise a single population, with some exchanges of individuals between regularly inhabited areas (Garnett et al., 2011, DoE 2016). It is estimated that 250 to 350 individual Regent Honeyeaters remain in the wild (EH 2024). However, as part of a NSW Government's Saving our Species program 300 individuals were bred in captivity then released into the wild, with these restocking efforts being on-going (EH 2024). The *National Recovery Plan for the Regent Honeyeater* (DoE 2016) has identified four regularly used areas for foraging and breeding, which are considered habitat critical to the survival of the species. These locations where critical habitat occurs are: 1. Bundarra-Barraba 2. Hunter Valley / Central Coast 3. Capertee Valley 4. Chiltern (DoE 2016). The project is located near Lithgow, which is approx. 40 km south of Capertee Valley, which is the nearest of these critical habitats. Moreover, the project area is located well south of important habitat mapped for the Regent Honeyeater, as per the BAM – important areas viewer (BAM 2025). That is, this important area map marks the Wolgan Valley as the closest Regent Honeyeater Important Area, which is approx. 25 km north of the project area. Based on this considerable distance from critical habitat, the project is not expected to impact critical habitat for this species. However, the species may still forage within the project area sporadically given the suitable habitat present and it is within the species' range. Nevertheless, this species has not been recorded in the project area. That is, the species was not recorded within the project area during the current study, despite extensive diurnal bird survey efforts (i.e. approx. 60 hours and 30 minutes over 34 days; see Section 6.3.5iia for methods). A lack of records of this species nearby the project area also suggest the potential habitat for the Regent Honeyeater in the project area does not appear to be frequently utilised by the Regent Honeyeater. That is, nearest Bionet record was in Lidsdale SF approx. 5 km north of the project area. Other nearest Bionet records for this species were recorded east of

Criteria	Discussion
	Lithgow, >10 km from the project area. As such, potential habitat in the project area is considered to be of low importance to the species' conservation and recovery. In summary: • the project area is located well away from critical habitat for the species • the project area is well away from BAM important habitat map for Regent Honeyeater • lack of detection of Regent Honeyeaters during surveys and a lack of local historic records suggest the species may infrequently and sporadically forage within project area only • there is no evidence to suggest the species regularly uses habitat within the project area for foraging / breeding • the affected habitat is considered to be of low importance to the species' conservation and recovery. Therefore, it is not expected that the project would lead to a long-term decrease in the size of a Regent Honeyeater population.
Would the action reduce the area of occupancy of the species?	**Unlikely.** Regent Honeyeater are widely dispersed across south-eastern Australia, often moving in response to food resource availability. Hence, the loss of 15.72 ha of potential foraging habitat toward the middle of the distribution of the species is unlikely to reduce the area of occupancy for the species. Moreover, considering that suitable habitat will be retained and enhanced within BSAs near the project, usage of this remnant woodland by this species should be supported in the long term. Hence, it is unlikely that the project would reduce the area of occupancy of the species.
Would the action fragment an existing population into two or more populations?	The Regent Honeyeater is a nomadic species that comprises a single population across south-eastern Australia. Given the relatively small scale of the project when compared to the distribution of the species, combined with the high mobility of the species, the project is unlikely to fragment the population.
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** The *National Recovery Plan for the Regent Honeyeater* specifies that habitat critical the survival of the species for the Regent Honey eater to as: • any breeding or foraging habitat in areas where the species is likely to occur (as defined by the distribution map provided in Figure 1 of the *Recovery Plan*) • any newly discovered breeding or foraging locations. The project area is included as an area the species is "*likely to occur*" on Figure 1 of the Recovery Plan (DoE 2016). This mapping of "likely areas" encompasses large expanses of NSW (DoE 2016). However, the project area is well away from areas identified as important to the Regent Habitat. Firstly, the project area is located well away from important habitat for Regent Honey eater; the nearest area in this mapping is at Wolgan Valley which is approximately 25 km north of the project area. Secondly, the project well away from Bundarra-Barraba, Hunter Valley/ Central Coast, Capertee Valley, or Chiltern, which are areas known to regularly support foraging and breeding habitat of the Regent Honeyeater Further, given no Regent Honeyeaters were observed in the project area despite extensive diurnal bird surveys (totalling approx. 60 hours and 30 minutes, over 34 days), whilst there are no historic records of the species within the project area (ALA 2025), the project is not considered to impact habitat critical to the survival of the species.
Would the action disrupt the breeding cycle of a population?	**Unlikely.** The Regent Honeyeater chiefly breeds in Bundarra – Barraba, Capertee Valley, and Hunter Valey. Given the project area is well away from these breeding areas, whilst the Regent Honeyeater has not been recorded within the project area historically or during comprehensive targeted bird surveys, it is considered unlikely that this species would breed in the project area. Therefore, the project is considered unlikely to disrupt the breeding cycle of a population of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project would reduce available potential foraging habitat by up to 15.72 ha for the Regent Honeyeater. However, given the species has not been recorded within the project area historically, nor during comprehensive targeted surveys undertaken as part of this assessment, it is considered unlikely that the loss of this potential foraging habitat would lead to the decline of this species.

Criteria	Discussion
Would the action result in invasive species that are harmful an endangered species becoming established in the endangered species' habitat?	**Unlikely.** The existing landscape contains invasive species, such as foxes, that are directly or indirectly harmful to the species, either through predation, competition or alteration of habitat. However, it is considered unlikely that the project would increase the occurrence of or threat presented by invasive species. The potential of such threats occurring in retained habitat would be mitigated through the CEMP and BMP for the project (see Section 8.3.3). Therefore, the impacts of the project are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the species.
Would the action introduce disease that may cause the species to decline?	**Unlikely** Diseases is not known to have a significant factor in the decline of the Regent Honeyeater (Jakob-Hoff et al. 2014). However, diseases have affected captive bred Regent Honeyeater's, so there is a risk that the release of such pathogens into the wild may impact the Regent Honeyeater population (Jakob-Hoff et al. 2014. However, the project does not involve the movement of animals or materials likely contaminated by pathogens, so is considered unlikely to introduce diseases that may cause either species to decline.
Would the action interfere with the recovery of the species?	**Unlikely.** The *National Recovery Plan for the Regent Honeyeater* provides the objectives, strategies, and actions for the recovery of the species (DoE 2016). The objective and strategy relevant to the project are: • enhance the condition of habitat across the regent honeyeater range to maximise survival and reproductive success and provide refugia during periods of extreme environmental fluctuation • improve the extent and quality of regent honeyeater habitat • protect intact (high quality) areas of regent honeyeater breeding and foraging habitat (as described in '3.4.6 Habitat critical to survival'). As explored above, the project area is not considered to provide critical to the survival of the species. As such, the loss of potential foraging habitat that is not known to support the species given a lack of local records and failure to detect in the current study, it is considered unlikely that the project would interfere with the recovery of the species.
Conclusion	**Significant impact unlikely.** Although the project may contribute to loss of some infrequently and sporadically foraging habitat through removal of some woodland habitat, it is considered unlikely that the project will have a significant impact on Regent Honeyeater.

13.2.2 Assessment of significance: Swift Parrot (EPBC Act: Critically Endangered)

Table 13.7 Swift Parrot (Critically Endangered)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	**Unlikely.** The project would result in the removal of potential foraging habitat for the Swift Parrot, comprising 64.72 ha of woodland and forest belonging to PCTs 3347, 3348, 3367, 3369, 3650, 3735 and 3747. The Swift Parrot is a migratory species, which moves from breeding habitat in Tasmania to southeastern Australia through winter (i.e. March to September). Whilst in NSW, Swift Parrot forage on flowers of eucalypts, and lerps (DCCEEW 2024e). Swift Parrots comprise a single population. The current population size in uncertain, however is estimated to be at 750 (range 300 to 1,000) mature individuals (DCCEEW 2014, Webb et al. 2021). The *Draft Swift Parrot Recovery Plan* (DCCEEW 2024e) has identified 18 key biodiversity areas (KBA) for the Swift Parrot, determined to meet one or more criteria in five categories: threatened biodiversity; geographically restricted biodiversity; ecological integrity; biological processes; and, irreplaceability (DCCEEW 2024e). Neither the project area, nor any immediately connected vegetation, is part of a KBA for the Swift Parrot. That is, the nearest KBA is Wollombi National Park, located >15 km to the east of the project area. Furthermore, the project area is located well south of important habitat mapped for the Swift Parrot, as per the BAM – important areas viewer (BAM 2025). That is, this important area map marks the Capertee Valley as the closest Swift Parrot Important Area, which is approx. 40 km north of the project area. Based on this considerable distance from important habitat for the Swift Parrot, the project is not expected to impact critical habitat for this species. Nevertheless, given the presence of potentially associated PCTs in the project area, the species may forage within the project area sporadically given the suitable habitat and being within the species' range. However, a lack of local records and failure to detect this species during surveys suggests use of foraging resources the project area is highly infrequent. That is, the species was not recorded within the project area, despite extensive). Moreover, there is a single record of Swift Parrot nearby Lithgow, which was made at South Bowenfels approx. 6 km southeast of the project area (ALA 2025). Such low sightings in the local area suggest the Swift Parrot is likely to be a highly infrequent to the project area. In summary: • the project area is located well away from critical habitat for the species • the project area is well away from BAM important habitat map for Swift Parrot • lack of detection of Swift Parrot during surveys and a lack of local historic records suggest the species may infrequently and sporadically forage within project area only • the affected habitat is considered to be of low importance to the species' conservation and recovery. Therefore, it is not expected that the project would lead to a long-term decrease in the size of a Swift Parrot population.
Would the action reduce the area of occupancy of the species?	**Unlikely.** When in NSW, Swift Parrots are widely dispersed, often moving in response to food resource availability. Hence, the loss of 64.72 ha f potential foraging habitat toward the middle of the distribution of the species is unlikely to reduce the area of occupancy for the species. Moreover, considering that suitable habitat will be retained and enhanced within BSAs nearby the project, usage of this remnant woodland by this species should be supported in the long term. Hence, it is unlikely that the project would reduce the area of occupancy of the species.
Would the action fragment an existing population into two or more populations?	**Unlikely.** The Swift Parrot is a migratory species that comprises a single population that moves into south-eastern Australia during winter months. Given the relatively small scale of the project when compared to the distribution of the species, combined with the high mobility of the species, the project is unlikely to fragment the population.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** • *National Recovery Plan for the Swift Parrot* (DCCEEW 2024e) defines habitat critical to the survival of the species as: • areas of priority habitat for which the Swift Parrot has a level of site fidelity • sites that possess phenological characteristics likely to be of importance to the Swift Parrot. The project area is not considered a priority habitat given it was not detected during targeted bird surveys undertaken as part of this assessment, whilst there is a lack of records in the Lithgow regions, with only one record approx. 6 km away from the project area. Moreover, the project area is located well away from the BAM important habitat mapping for the Swift Parrot, which is based on known areas of relatively high utilisation. Hence, the project area does not represent a priority habitat given there is no known site fidelity for Swift Parrot. Furthermore, the project largely lacks Eucalypt species that have a winter flowering phenology, which allows for nectar to be available for Swift Parrot when in southeastern Australia. That is, the *Draft National Recovery Plan for the Swift Parrot* (DCCEW 2024e) defines habitat critical to the survival of the species, on the Australian mainland, as known and likely foraging habitat with any (or a combination of) 10 eucalypts, being foraging trees species. Preferred foraging species within known and likely habitats include: • Yellow Gum (*Eucalyptus leucoxylon*) • Red Ironbark (*E. tricarpa*) • Mugga Ironbark (*E. sideroxylon*) • Grey Box (*E. macrocarpa*) • White Box (*E. albens*) • Yellow Box (*E. melliodora*) • Swamp Mahogany (*E. robusta*) • Forest Red Gum (*E. tereticornis*) • Blackbutt (*E. pilularis*); and • Spotted Gum (*Corymbia maculata*) (DCCEEW 2024e). However, the project area only has one important species, in low frequency. Specifically, the project area contains some stands of Yellow Box to the south of Farmers Creek. This area south of Farmers Creek represents a small portion of the project area. Similar vegetation in the lower elevations surrounding Lake Lyell, supports Yellow Box trees, as mapped by the SVTM (PCT 3367 - Central Tableland Granites Grassy Box Woodland), and confirmed by site inspections. Most of this vegetation, which supports Yellow Box trees surrounding Lake Lyell will be retained, conserving the majority of potential foraging habitat for the Swift Parrot in the lower valley around Lake Lyell. Hence, limit foraging resources for the Swift Parrot will be impacted by the project. Based on a lack of priority habitat within the project area (i.e. no known foraging), and limited removal and retention of potential foraging resources provided by Yellow Box, the project is considered unlikely to adversely affect habitat critical to the survival of the Swift Parrot.
Would the action disrupt the breeding cycle of a population?	**Unlikely.** The Swift Parrot only breeds in Tasmania. Therefore, the project is considered unlikely to disrupt the breeding cycle of either population.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project would reduce available potential foraging habitat by up to 64.72 ha for the Swift Parrot and the removal of some Yellow Box, which may consist of preferred foraging resources for the species. However, given the species has not been recorded within the project area historically, nor during comprehensive targeted surveys undertaken as part of this assessment, combined with the substantial distance from mapped important habitat (see above) and location outside a KBA, it is considered unlikely that the loss of this potential foraging habitat would lead to the decline of this species.

Criteria	Discussion
Would the action result in invasive species that are harmful an endangered species becoming established in the endangered species' habitat?	**Unlikely.** The existing landscape contains invasive species, such as foxes, that are directly or indirectly harmful to the species, either through predation, competition or alteration of habitat. However, it is considered unlikely that the project would increase the occurrence of or threat presented by invasive species. The potential of such threats occurring in retained habitat would be mitigated through the CEMP and BMP for the project (see Section 8.3.3). Therefore, the impacts of the project are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the species.
Would the action introduce disease that may cause the species to decline?	**Unlikely.** Swift Parrots are susceptible to Psittacine beak and feather disease (PBFD). This disease can remain viable for many years in hollows and nest boxes (TSSC 2001). However, given Swift Parrot breed in Tasmania, it is not expected that hollows would be utilised within the project area. Moreover, given project does not involve the movement of animals or materials likely to be contaminated by pathogens, the project is considered unlikely to introduce diseases that may cause either species to decline.
Would the action interfere with the recovery of the species?	**Unlikely.** The *National Recovery Plan for the Swift Parrot* provides the objectives, strategies, and actions for the recovery of the species (DCCEEW 2024e). The objective and strategy relevant to the project are: • By 2032, maintain or improve the extent, condition and connectivity of habitat of the Swift Parrot (DCCEEW 2024e). • By 2032, anthropogenic threats to Swift Parrot are demonstrably reduced (DCCEEW 2024e). • Maintain known Swift Parrot breeding and foraging habitat at the local, regional and landscape scales (DCCEEW 2024e). • Protect areas of 'habitat critical to survival' not managed under Regional Forest Agreements from developments (e.g. from residential developments, mining activity, wind and solar farms) and land clearing for agriculture through local, state and Commonwealth Government mechanisms (DCCEEW 2024e). Manage important winter foraging habitat and provide adequate on-going conservation management resources where appropriate (DCCEEW 2024e). As discussed above, the project area is not considered habitat critical for the survival of the species given it is located outside a KBA, well away from mapped important habitat for the Swift Parrot, whilst there are no known historic records nearby the project area whilst targeted surveys failed to detect this species. Moreover, only a small extent of one potentially important food resource (i.e. Yellow Box) will be impacted by the project, whilst more extensive areas of Yellow Box would be retained within the Lake Lyall catchment. Hence, it is not expected that the project would interfere with the recovery of the species given the project area is habitat critical to survival nor known to be utilised by the Swift Parrot.
Conclusion	**Significant impact unlikely.** Although the project may contribute to loss of some infrequently and sporadically foraging habitat in the migratory range through removal of some woodland habitat, it is considered unlikely that the project will have a significant impact on Swift Parrot.

13.2.3 Assessment of significance: Gang-gang Cockatoo (EPBC Act: Endangered)

Table 13.8 Assessment of significance: Gang-gang Cockatoo (EPBC Act: Endangered)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	**Likely**. The Gang-Gang Cockatoo has a wide distribution throughout New South Wales, the ACT and Victoria. While there is limited research regarding the extent of seasonal migrations undertaken by the species, only one distinct subpopulation is recognised, occurring in the Hornsby and Kur-ring-ai Local Government Areas of Sydney. Across the rest of the Gang-Gang Cockatoo's range, the species is likely to occur as part of one continuous or possibly several large regional subpopulations. The Gang-Gang Cockatoo is known to utilise the disturbance footprint for foraging and is likely to use hollows within the area for breeding. The project will thus remove 101.35 ha of known and potential habitat, containing many potential breeding hollows, 11 of which have shown signs of nesting by the species. These habitat values are considered critical to the survival of the species by the Commonwealth Conservation Advice (DAWE 2022). The reduction of foraging habitat and the removal of likely and potential nesting hollows by the project may reduce breeding success for the species within the immediate area.
Would the action reduce the area of occupancy of the species?	**Likely**. According to the Commonwealth Conservation advice for the Gang-Gang cockatoo (DAWE 2022), any removal of habitat considered critical to the survival of the species will interfere with the recovery of the Gang-gang cockatoo and reduce its Area of Occupancy (AOO). Given that all foraging habitat is considered habitat critical to the survival of the species (DAWE 2022), the project may be deemed to result in the reduction of the species' Area of Occupancy. Furthermore, as recommended by International Union for Conservation (IUCN) guidelines (IUCN, 2014), the area of occupancy of a species is typically measured by the presence of the species within 2 km x 2 km (400 ha) grid cells. The project is certainly not expected to reduce the occupancy of the Gang-gang across a 400 ha area and is therefore not expected to reduce the species' area of occupancy at the scale it is currently calculated.
Would the action fragment an existing population into two or more populations?	**Unlikely.** As discussed, the Gang-Gang Cockatoo is likely to occur as one continuous south-eastern Australian population or several large, regional subpopulations. The extent of clearing proposed for the project will not fragment Gang-Gang populations at this regional or broader south-eastern Australian scale. Furthermore, given the mobile nature of the species, the project is unlikely to isolate areas of foraging and breeding habitat within the locality.
Would the action adversely affect habitat critical to the survival of a species?	**Likely**. The project will remove breeding and foraging habitat which is considered to constitute habitat critical to the survival of the species.
Would the action disrupt the breeding cycle of a population?	**Likely**. The project will remove many potentially suitable breeding hollows, of which 11 have demonstrated signs of use by Gang-Gang Cockatoos. Furthermore, it will remove known foraging habitat utilised by the species during the breeding season. These impacts may impact local breeding success for the Gang-Gang Cockatoo.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Likely**. The removal of 101.35 ha of habitat, including breeding habitat, may lead to a reduction in breeding success for the species and result in a decrease in the population in the immediate area.

Criteria	Discussion
Would the action result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat?	**Unlikely**. According to the Commonwealth Conservation Advice (DAWE 2022a), the Gang-Gang Cockatoo is susceptible to competition with native and invasive species identified as significant nest hollow competitors, such as feral honeybees, possums, starlings, Noisy Miners, and Common Mynas. Site hygiene protocols will be in place during construction to minimise the risk of introduction of invasive species. Furthermore, given the abundance of suitable hollows in the locality, it is considered unlikely that vegetation clearing for the project would significantly increase nest hollow competition from other native and invasive species within adjacent areas.
Would the action introduce disease that may cause the species to decline?	**Unlikely**. The Gang-gang Cockatoo is susceptible to Psittacine Beak and Feather Disease (PBFD), a potentially fatal disease caused by psittacine circovirus, typically transferring between adults, nestlings, and contaminated nest hollows DAWE (2022a). Given that the disease transfers via contact with diseased individuals or contaminated nest hollows, the project is unlikely to introduce disease that may cause the species to decline.
Would the action interfere with the recovery of the species?	**Likely**. The Conservation advice (DAWE 2022a) states that removal of any habitat critical to the survival of the Gang-gang Cockatoo will interfere with the recovery of the species. It also describes the retention of known nesting hollows as a conservation recovery objective of the species. Due to the removal of 101.35 ha of habitat, including breeding habitat, the project may be considered to interfere with the recovery of the Gang-gang Cockatoo.
Consideration of impacts from 2019-2020 bushfires.	The Gang-gang Cockatoo was heavily impacted by the 2019/20 bushfires, with suspected impacts contributing to the uplisting of this species from vulnerable to endangered under the EPBC Act in 2022 (DAWE 2022a). Specific impacts from these bushfires are cited in the Conservation advice as: • 28 to 36% of the species distribution affected by fire (Cameron et al 2021) • potential reduction in the carrying capacity of 40% of occupied grid cells for the species and reduction in total population size by 10% (Cameron et al 2021) • potential long-term reduction in population size, with estimates ranging from 29-53% three generations post fire (Legge et al 2021). The construction envelope and contiguous woodland and forest in the Marangaroo National Park and Lidsdale State Forest were not affected during the 2019/20 bushfires. However, more than 60% of the nearby Greater Blue Mountains World Heritage Area was burnt, with over half of this burnt with high or very high severity (NSW DCCEEW 2020). The Gang-gang Cockatoo is known to occur across this area, and both summer breeding and winter foraging habitat in the region is likely to have been affected by the 2019/20 fires. Accordingly, it is possible that habitat within the disturbance footprint provides important, unburnt foraging and breeding habitat for the species within the region.
Conclusion	**Likely significant impact.** Based on the assessment provided above, the project is considered likely to have a significant impact on the Gang-gang Cockatoo.

13.2.4 Assessment of significance: Koala (EPBC Act: Endangered)

Table 13.9 Assessment of significance: Koala (EPBC Act: Endangered)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	**Possibly**. The disturbance footprint provides suitable habitat for the Koala due to the presence of feed trees known to be used by the species in the Central and Southern Tablelands Koala Management Area (KMA) including the following species identified as being used by the species in the region in *A review of koala tree use across New South Wales* (OEH, 2018): • *Eucalyptus mannifera* (high use) • *Eucalyptus dives* (high use) • *Eucalyptus rossii* (high use) • *Eucalyptus bridgesiana* (irregular use) • *Eucalyptus bridgesiana* (irregular use) • *Eucalyptus melliodora* (irregular use) • *Eucalyptus viminalis* (low use) • *Allocasuarina littoralis* (low use). Other tree species in the construction envelope are also likely to be used less frequently. The Koala was detected during detection dogs finding faecal pellets in two adjacent locations, in a single area of the construction envelope. This indicated at least some use of habitat within the construction envelope. A BioNet search of historic records for the koala was undertaken to appreciate the potential extent of koala populations within native vegetation immediately connected to the project (BCS 2025a). That is, there are no koala records to date within this database made north of Magpie Hollow Road and South of Great Western Highway, including within the adjacent Marrangaroo National Park and Lidsdale State Forest. A lack of records suggest habitat in this region is not currently significant koala habitat, at least during recent periods (noting that BioNet records for koala typically date back to 1960s in the local area). As such, the frequency of detections and infrequent detections of faecal pellets by detection dogs suggests the species is considered likely to currently occur intermittently and at low densities within the construction envelope. Based on detection of koala in the Construction footprint, it is possible that the project may to lead to a small long-term decrease in the size of a population of Koala through the loss of 99.31 ha of habitat.
Would the action reduce the area of occupancy of the species?	**Unlikely.** IUCN guidelines recommend that the area of occupancy of a species is measured by the presence of the species within 2 km x 2 km (400 ha) grid cells. The project is not expected to reduce habitat for the Koala at this scale. As such, the project is not expected to reduce the area of occupancy of the Koala.
Would the action fragment an existing population into two or more populations?	**Unlikely.** The area to be cleared for the project will remain surrounded by large tracts of remnant woodland to the east and west, with Marangaroo National Park to the north. While the project may impede movement immediately around the construction area, connectivity across this broader tract of contiguous woodland is expected to be retained. Accordingly, the project is unlikely to fragment a population of the Koala.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Possibly.** No critical habitat has been listed for the Koala under the EPBC Act. Nevertheless, habitat critical to the survival of a species may include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • the reintroduction of populations or recovery of the species or ecological community (DoE, 2013). The national recovery plan for the Koala states that the following are key factors in evaluating whether habitat is critical to the survival of Koalas: a) whether the habitat is used during periods of stress (examples flood, drought or fire) b) whether the habitat is used to meet essential life cycle requirements (e.g. foraging, breeding, social behaviour, dispersal) c) the extent to which the habitat is used by important populations d) whether the habitat is necessary to maintain genetic diversity and long-term evolutionary development e) whether the habitat is necessary for use as corridors to allow the species to move freely between sites used to meet essential life cycle requirements f) whether the habitat is necessary to ensure the long-term future of the species or ecological community through reintroduction or re-colonisation g) any other way in which habitat may be critical to the survival the species (DAWE 2022a). Suitable habitat is present within the disturbance footprint with several high use Koala feed trees present, whilst the species has been detected during surveys that suggest Koala may occur intermittently and at low densities. The habitat within the construction envelope is likely used to meet essential life cycle requirements of foraging due to the presence of key feed tree species. However, the importance of habitat in the construction envelope may increase through time, with records of a disease-free Koala population in the Lithgow region apparently recovering following the 2019/20 bushfires. This includes recent sightings of Koala at Hassans Walls, near Lithgow (approximately 6 km west of the construction envelope), as well as Newnes Plateau (approximately 15 km northwest of the construction envelope) and Kanangra-Boyd National Park (approximately 20 km south of the construction envelope) (ABC News 2022). The apparent recent increase in local records in the Lithgow region suggests potential habitat connected to areas supporting recovery of the Koala, including the construction envelope, may be important ensuring the long-term future of the species through reintroduction re-colonisation. As such, habitat in the construction envelope may be considered habitat critical to the survival of Koala. Therefore, the project may adversely affect habitat critical to the survival of the species.
Would the action disrupt the breeding cycle of a population?	**Possibly.** Given detection of koala within the construction envelope, it is possible that the construction envelope provides breeding habitat for Koala, at least for a low-density population. The importance of habitat provided within the construction envelope for breeding of this population of koala is unknown. As such, it is considered possible that the project could disrupt the breeding cycle of a population through removing potential breeding habitat.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Likely.** The project would reduce habitat for the species by up to 99.31 ha. Given Koalas have been detected within the construction envelope, the disturbance footprint likely supports part of a low-density population of the species. As such, it is possible that the project could cause the species to decline through the removal and modification of habitat.

Criteria	Discussion
Would the action result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat?	**Unlikely.** The conservation advice for the Koala (DAWE, 2022) defines encounters with dogs as a direct threat to the Koala. It is considered highly likely that wild dogs are already present within the construction envelope. Prior to construction, site hygiene protocols will be prepared which will include minimisation and mitigation measures to prevent the spread of invasive species during construction and operation of the project. Accordingly, the impacts of the project are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the Koala (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	**Unlikely.** Koalas carry a range of diseases including chlamydial disease, Koala retrovirus, and Koala herpesvirus infections. They are also subject to infestation of trypanosomes, and sarcoptic mange (DAWE 2022c). The project is unlikely to introduce these or any other pathogens or parasites to the construction envelope. Prior to construction, site hygiene protocols will be prepared which will include minimisation and mitigation measures to prevent the spread of disease throughout the construction and operation of the project.
Would the action interfere with the recovery of the species?	**Likely.** The National Recovery Plan for the Koala (DAWE 2022c) lists four overarching objectives for the species' recovery: 1. The area of occupancy and estimated size of populations that are declining, suspected to be declining, or predicted to decline are instead stabilised then increased. 2. The area of occupancy and estimated size of populations that are suspected and predicted to be stable are maintained or increased. 3. Metapopulation processes are maintained or improved. 4. Partners, communities and individuals have a greater role and capability in listed Koala monitoring, conservation and management. The disturbance footprint appears to support a small proportion of a low density, local population of Koala as the species was detected on site. However, this area is likely to be important for the recovery of the local population of Koala, given increasing local sightings in the Lithgow Area since the 2019/2020 bushfires. Hence, the project may interfere with key recovery objectives 1 and 2 for the Koala through reducing habitat and therefore potentially impacting the size of a population and its ability to stabilise or increase in numbers.
Consideration of impacts from 2019-2020 bushfires.	The disturbance footprint and contiguous woodland across the locality were not affected by the 2019/20 bushfires but nearby areas of the Newnes Plateau and Wolgan Valley were severely affected. Accordingly, the project may contribute to the cumulative impacts of these fires for the local population of Koala.
Conclusion	**Likely significant impact.** Based on the assessment provided above and given a lack of scientific certainty of the extent of the local population of Koala and importance of habitat provided in the construction envelope, the precautionary principle was applied by considering that the project is likely to have a significant impact on the Koala.

13.2.5 Assessment of significance: Purple Copper Butterfly (Bathurst Copper Butterfly) (EPBC Act: Vulnerable)

Table 13.10 Assessment of significance: Purple Copper Butterfly (Bathurst Copper Butterfly) (EPBC Act: Vulnerable)

Criteria	Discussion
Would the action lead to a long term decrease in the size of an important population of a species?	**Unlikely.** The Purple Copper Butterfly primarily occurs in an area of the Central Tablelands bounded by Capertee, Black Springs, Hartley and Bathurst (TSSC 2016a). Within the Central Tablelands, it is currently unknown whether the species occurs as a single population with genetic exchange, or several smaller isolated subpopulations. Genetic study of the species has shown that the individual populations are closely related which indicates either some movement of the species between populations, or that populations have only recently become genetically isolated (NPWS 2001). The concept of metapopulations has been applied to the species in the Lithgow Valley area (Dexter & Kitching 1991a). The species is likely to exist as a metapopulation (a group of interconnected populations) in the locality, where multiple small areas of habitat are occupied, and where a natural pattern of extinctions and colonisation of habitat occur (NPWS 2001). For the purposes of this assessment, the construction envelope is considered to be part of the range of an important population of the species. Habitat disturbance is required to maintain the larval host plant, which becomes an unsuitable habitat for Purple Copper Butterfly as it senesces (Braby 1990; Braby 2000 in Healy and Wassens 2008). Fire and other disturbance such as cutting cause the host plant to become more compact (Cayzer et al. 1999; New et al. 2000 in Wassens 2008) and to produce fresh growth favoured the species (NPWS 2001). Almost all sites where the species has been recorded are associated with significant levels of disturbance such as mining, roadways or frequent fire that have resulted in an open vegetation structure and an understorey dominated, or well represented, by the host plant (NPWS 2001). After fire events, populations can increase rapidly and spread through connected habitat and possibly reoccupy or invade areas of fresh growth of the host plant (TSSC 2016a). A series of occupied sites within the landscape may be necessary for the persistence of the species by acting as sources of invasion to new or previously occupied sites after landscape scale or local-scale disturbance events (TSSC 2016a).The NPWS fire history map shows no history of fire in the construction envelope and just two small fires in adjacent areas of Marrangaroo National Park, about 3.1 ha in 2001 and about 1.7 ha in 2019. No evidence of recent fires was observed in the construction envelope and it appears that the area has not burned for more than 20 years. The only source of recent disturbance in the construction envelope that could produce suitable conditions for the species is vegetation maintenance within the existing power transmission line. These disturbed areas are lower in altitude (<850 m) than any location described in literature and other publications describing habitat for the species. However, the NSW threatened species profile includes a geographic constraint of 800 m altitude for the species. In September 2024, the author (Paul Rossington) observed one to two individuals of the species in the vicinity of Palmers Oaky (unrelated to the project) at altitudes of approximately 803 m and 815 m. The observed location was in a large patch of mature and immature *Bursaria spinosa* in structurally intact dry sclerophyll eucalypt woodland to open forest. The site is within 10-20 m of a fire trail but did not show any signs of physical disturbance or recent fire. This observation shows that the species can occur in areas that have not been subjected to recent disturbance and at altitudes as low as 800 m asl. The paucity of previous records of the species below 850 m or in areas with minimal disturbance may be due to the species occurring in smaller numbers in such habitat and due to the focus of survey effort in areas considered to be more suitable. The Purple Copper Butterfly was not recorded in the construction envelope during surveys for the project, which targeted apparently suitable habitat in the form of high altitude (>800 m) open woodland/forest and derived shrubland in areas containing the larval food plant *Bursaria spinosa* subsp. *lasiophylla.* Areas of derived shrubland in the existing powerline were intensively surveyed as they were the only areas where recent disturbance had occurred, prompting abundant growth of the host plant. Based on the recent observation of the species at Palmers Oaky, this habitat is considered to be suitable despite its relatively low (<850 m) altitude due to the dense growth of *Bursaria spinosa*, high sun exposure and the presence of the Bright Copper Butterfly (*Paralucia aurifera*), which is often associated with the Purple Copper Butterfly.

Criteria	Discussion
	A single individual of Purple Copper Butterfly was opportunistically recorded approximately 300 m from the construction envelope, in a powerline easement in Marrangaroo National Park. As the species was not detected in the construction envelope during project surveys, it is unlikely to occur in high numbers or to be widespread there at present. However, given that the species was recorded about 300 m away, parts of the construction envelope containing the host plant are likely to become more suitable as habitat when they are next disturbed, either through fire or physical disturbance. While the project would result in the loss of approximately 9.3 ha of habitat that would be likely to support the species post-disturbance, it is considered unlikely that a substantial proportion of the local meta-population presently occupies the construction envelope. The project would also result in disturbance which is likely to produce conditions more suitable for the species in parts of the construction envelope above 800 m altitude, outside of the operational footprint, where native vegetation would be reestablished. As such, the project is not expected to lead to a long-term decrease in the size of an important population of the species.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The IUCN recommends standardization of estimates of area of occupancy by applying a 2 km x 2 km grid to occurrence data, a method which is adopted in assessment of conservation status under the EPBC Act (TSSC 2015b). The project is unlikely to the reduce area of occupancy of the species as defined a 2 km x 2 km grid applied to occurrence data as it will not result in the complete loss of potential habitat from any individual grid cell.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** The construction envelope is not located in an area of contiguous habitat connecting any areas known to be occupied by the species Furthermore, the area to be cleared will remain surrounded by large tracts of contiguous vegetation to the east, north and west. As such, substantial connectivity will remain across remnant woodland within the locality. It is unlikely to fragment an existing important population into two or more populations.
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** Habitat critical to the survival of the Purple Copper Butterfly is not defined in the conservation advice (DoEE 2016x). However, habitat critical to the survival of a species may generally be described (DoE 2013) as areas necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • the reintroduction of populations or recovery of the species or ecological community. The Purple Copper Butterfly was not detected during targeted surveys and few if any individuals of the species are likely to presently occupy habitats within the construction envelope. While the species may increase in abundance and distribution in the disturbance footprint during times of dispersal following disturbance events such as fire, the area to be cleared is not considered critical to the survival of the species. Furthermore, given connectivity will remain throughout contiguous woodland to the east, north and west of the project, it is considered unlikely that the project would create barriers to dispersal and genetic exchange for the species throughout the broader locality. Accordingly, the action is not expected to adversely affect habitat critical to the survival of the species.
Would the action disrupt the breeding cycle of an important population?	**Unlikely**. While the project would result in the loss of 13.86 ha of habitat that would be likely to support the species post-disturbance, it is considered unlikely that a substantial proportion of the local population presently occupies the construction envelope. The project would also result in disturbance which is likely to produce more suitable conditions for the species in 13.86 ha of the construction envelope. The project is unlikely to significantly disrupt the breeding cycle of an important population of the species.

Criteria	Discussion
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely**. While the project would result in the loss of 13.86 ha of habitat that would be likely to support the species post-disturbance, it is considered unlikely that a substantial proportion of the local meta-population presently occupies the construction envelope. The project would also result in disturbance which is likely to produce conditions suitable for the species in 13.86 ha of the construction envelope above 800 m altitude, outside of the operational footprint, where native vegetation would be reestablished. As such, the project is not expected to affect habitat to an extent that that the species would be likely to decline.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** There are no known diseases associated with this species. The Conservation Advice for the Purple Copper Butterfly (TSSC 2016a) cites the following invasive threats to the species: • Invasion of weeds, particularly blackberry and scotch broom, with outcompete Blackthorn habitat. • Uprooting of habitat by pigs and goats. Site hygiene protocols and weed control measures will be in place during construction to minimise the risk of introduction and spread of invasive species, and as such, it is considered unlikely that the project would facilitate the spread of invasive species or their adverse impacts to the survival of the species (either directly or indirectly). It is considered unlikely that the project could facilitate the introduction of any pathogens that may cause the species to decline.
Would the action interfere substantially with the recovery of the species?	**Unlikely.** The Purple Copper Butterfly was not detected during targeted surveys and is not considered likely to be abundant or widespread within the disturbance footprint. While the project will remove habitat which may currently support a small number of individuals and which could become highly suitable for the species following disturbance events, the area to be removed represents a small proportion of suitable open woodland habitat present in the locality. Vegetation restoration in areas of the project Footprint outside of the operational footprint would aim to create and maintain conditions suitable for the species. As such, the project is not expected to interfere substantially with the recovery of the species.
Consideration of impacts from 2019-2020 bushfires.	The species may benefit from moderately frequent and intense fire and numerous post-2020 records of the species in the Lithgow area (ALA 2025) suggest that the species was not badly affected by the 2019-2020 bushfires.
Conclusion	**Significant impact unlikely.** Based on the assessment provided above, the project is not expected to have a significant impact on the Purple Copper Butterfly

13.2.6 Assessment of significance: Spotted-tailed Quoll (EPBC Act: Endangered)

Table 13.11 Assessment of significance: Spotted-tailed Quoll (EPBC Act: Endangered)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of a population?	**Unlikely.** The Spotted-tailed Quoll has not been recorded on site or in the locality. The construction envelope may provide suitable habitat for the Spotted-tailed Quoll due to the presence of vegetation types known to be used by the species (TSSC 2020). It is possible the species occurs in habitat connected to that of the construction envelope. However, due to the lack of records during surveys of the construction envelope and lack of historical records from the project area or in the lands of the adjacent national park and state forest, it is unlikely that the construction envelope is currently or frequently occupied by the species. Home-range estimates across multiple studies for the species, range from 359 ha to at least 4186 ha for males, and 88 ha to at least 1,157 ha for females (Claridge et al 2005). The 101.35 ha of potential habit for the species which would be impacted represents, is equivalent in area of the home-range of no more than one individual of the species. The project is unlikely to lead to a long-term decrease in the size of a population of Spotted-tailed Quoll.
Would the action reduce the area of occupancy of the species?	**Unlikely.** The IUCN recommends standardization of estimates of area of occupancy by applying a 2 km x 2 km grid to occurrence data, a method which is adopted in assessment of conservation status under the EPBC Act (TSSC 2015b). The project is not expected to reduce habitat for the Spotted-tailed Quoll at this scale. Furthermore, the species has never been recorded in the project area nor in the lands of the adjacent National park and State forest. As such, the project is not expected to reduce the area of occupancy of the Spotted-tailed Quoll.
Would the action fragment an existing population into two or more populations?	**Unlikely.** The area to be cleared for the project will remain surrounded by large tracts of remnant woodland to the east and west, with Marangaroo National Park to the north. While the project may impede movement immediately around the project footprint, connectivity across this broader tract of contiguous woodland is expected to be retained. The project is unlikely to fragment any quoll populations that may occur, into multiple populations.
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** No critical habitat has been listed for the Spotted-tailed Quoll under the EPBC Act. Habitat critical to the survival of a species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • the reintroduction of populations or recovery of the species or ecological community (DoE, 2013). As there is no recorded utilisation of the potential habitat in the species has never been recorded in the project area nor in the lands of the adjacent National park and State forest, the affected habitat is unlikely to constitute habitat critical to the survival of a species It is therefore unlikely the project will affect habitat critical to the survival of the Spotted-tailed Quoll.
Would the action disrupt the breeding cycle of a population?	**Unlikely.** The project would affect possible den sites such as tree hollows, small boulder piles and fallen logs. Removal of these features could temporarily disrupt the breeding cycle for a small proportion of a population of the species, if one does indeed occur within the construction envelope. Given that the area affected approximates the lower end of the home-range size of an individual of the species, it is unlikely it would significantly affect the breeding cycle of a population of the species.

Criteria	Discussion
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project would reduce potential habitat by up to 101.35 ha. This reduction in potential habitat could result in a small long-term reduction in the size of a local population of the species, if one occurs within the construction envelope and adjacent lands, by removing an area of habitat equivalent to the smallest recorded home range estimates for individuals of the species. The Removal of an area of this size is unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Would the action result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat?	**Unlikely.** The conservation advice for the Spotted-tailed Quoll (TSSC 2020) defines competitive and/or predatory interactions with wild dogs and foxes as a direct threat to the species. It is known that foxes are already present within the construction envelope and likely that feral cats and wild dogs also occur there, at least intermittently. Waste management during the construction and operation of the site would ensure that the project does not attract additional invasive species to the area. Prior to construction, site hygiene protocols will be prepared which will include minimisation and mitigation measures to prevent the spread of invasive species during construction and operation of the project. Accordingly, the impacts of the project are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the Spotted-tailed Quoll (either directly or indirectly).
Would the action introduce disease that may cause the species to decline?	**Unlikely.** There are no diseases known to affect the Spotted-tailed Quoll and the project is unlikely to introduce pathogens to the area. Prior to construction, site hygiene protocols will be prepared which will include minimisation and mitigation measures to prevent the spread of disease throughout the construction and operation of the project.
Would the action interfere substantially with the recovery of the species?	**Unlikely.** The National Recovery Plan for the Spotted-tailed Quoll lists objectives and actions for the species recovery (DELWP 2016). The following is a subset of objectives relevant to the project: • determine and manage the threat posed by introduced predators (foxes, cats, wild dogs) and of predator control practices on Spotted-tailed Quoll populations • reduce the frequency of Spotted-tailed Quoll road mortality • reduce the rate of habitat loss and fragmentation on private land. As discussed in Section 8.2, the project is unlikely to substantially increase road mortality or habitat fragmentation. The clearing of 101.35 ha of potential habitat for the species would detract from the objective of reducing the rate of habitat loss and fragmentation on private land. However, given that the area cleared is relatively small in relation to home-range size estimates for the species (less than the typical home range size of an individual), and the species is not known to occur within or adjacent to the construction envelope, the project is unlikely to interfere substantially with the recovery of the species.
Consideration of impacts from 2019-2020 bushfires.	The disturbance footprint and contiguous woodland across the locality were not affected by the 2019/20 bushfires. Accordingly, the project is not expected to contribute to the cumulative impacts of these fires on a population of the species, if one does indeed occur in the locality.
Conclusion	**Significant impact unlikely.** Based on the assessment provided above, the project is unlikely to significantly impact the Spotted-tailed Quoll.

13.2.7 Assessment of significance: Glossy Black Cockatoo (south-eastern subspecies)- (EPBC Act: Vulnerable)

Table 13.12 Assessment of significance: Glossy Black Cockatoo (south-eastern subspecies) (EPBC Act: Vulnerable)

Criteria	Assessment
Would the action lead to a long-term decrease in the size of an important population of a species?	**Possibly.** An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species' range. The South-eastern Glossy Black Cockatoo (hereafter referred to as Glossy Black Cockatoo) occurs as a single population north from Mitchell, Queensland through eastern New South Wales to East Gippsland, with more scattered occurrences inland as far west as the NSW Riverina (DCCEEW 2022). While birds in the Riverina were previously considered an isolated population, they are now considered connected to the main population (Cameron et al 2021). The concept of an important population is therefore not readily applicable to the Glossy Black Cockatoo and important habitat is used in this assessment in place of the important population concept. For the purposes of this assessment, important habitat is considered to include habitat known to be occupied by the species that: • is important either for breeding or dispersal • necessary for maintaining genetic diversity, and/or • near the limit of the species range. The project would remove 101.35 ha of known and potential habitat for the Glossy Black Cockatoo, comprising: • 3.62 ha of known, high-quality foraging habitat that may also have potential as breeding habitat • a probable current nesting site for a single breeding pair • potential breeding habitat containing large hollow-bearing trees but very few individuals of preferred feed tree species. The 3.62 ha of foraging habitat to be removed for the project is not expected to represent a substantial proportion of foraging resources available in the woodlands and forests in the broader area (including Marrangaroo National Park) that is connected with the habitat of the construction envelope, nor across the broader region. However, given the paucity of such foraging habitat in the immediate vicinity, it may be important for the individuals utilising this habitat. The project could result in a small long-term decrease in the South-eastern Glossy Black-Cockatoo population through reduced breeding success for one or more breeding pairs found in the immediate vicinity of the construction envelope.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** IUCN guidelines recommend that the area of occupancy of a species is measured by the presence of the species within 2 km x 2 km (400 ha) grid cells. The project will remove some habitat known to be utilised by the species and additional vegetation that constitutes potential habitat, measuring 101.35 ha. The project is not expected to exclude the species an entire 2 km x 2 km area. Therefore, the project is not expected to reduce the area of occupancy of the South-eastern Glossy Black-Cockatoo population.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** Owing to the mobility of the species and that substantial habitat connectivity would remain surrounding the construction envelope, the project is unlikely to fragment an existing important population into two or more populations.

Criteria	Assessment
Would the action adversely affect habitat critical to the survival of a species?	**Possibly.** According to the conservation advice (DCCEEW 2022), habitat critical to the survival of the species is broadly defined as areas that are necessary: • for activities such as foraging, breeding, roosting, or dispersal • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development • for the reintroduction of populations or recovery of the species or ecological community The disturbance footprint contains 3.32 ha of known *Allocasuarina* foraging habitat for the species, and a likely nest site which may be considered habitat critical to the survival of the Glossy-black Cockatoo. Additionally, the disturbance footprint contains many possibly suitable hollow-bearing trees which could support breeding for the Glossy-black Cockatoo.
Would the action disrupt the breeding cycle of an important population?	**Possibly**. No conclusive evidence of breeding has been detected within the construction envelope despite extensive targeted survey; however, available evidence suggest that a single pair may nest on the site at present. A substantial number of hollow-bearing trees of a size suitable for the species would also be lost. The loss of these hollows could increase competition for nesting site for the species in the local context, thereby disrupting the breeding cycle of a small proportion of the population.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Possibly**. The project would result in a reduction in habitat of a type that may be considered habitat critical to the survival of the species. Accordingly, the project may affect habitat to the extent that the species is likely to suffer a small local decline in population.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** According to the Conservation Advice (DCCEEW 2022), invasive weeds pose a minor threat to the Glossy-black Cockatoo, primarily by altering the floristic and structural characteristics of habitat and by potentially increasing habitat flammability. Site hygiene protocols will be in place during construction to minimise the risk of introduction of invasive species, and as such, it is considered unlikely that the project would facilitate the spread of invasive species or their adverse impacts to the survival of the species (either directly or indirectly).
Would the action interfere substantially with the recovery of the species?	**Unlikely**. The Conservation Advice (DCCEW 2022x) outlines several conservation and recovery actions for the species, of which the following are relevant to the project: • Protect, restore and enhance the quality of known suitable habitat and increase the extent of habitat (both breeding and foraging) for south-eastern glossy black cockatoo across the subspecies' range (both current and future) to maintain viability in response to threats, including climate change. • Protect large old trees and smaller trees that contain large hollows, including those affected by fires. Ensure the recruitment of large old trees by retaining medium-sized trees, facilitating regeneration, and undertaking replanting. The project would result in the removal of 3.62 ha of known, high quality foraging habitat for the species, a likely nesting site for a single breeding pair and numerous hollow-bearing trees that may have potential as breeding habitat over an additional area of 101.35 ha. Hence, the project may be considered to interfere with the species' recovery. The area of potential habitat for the species contiguous with that of the construction envelope is greater than 4,000 ha and hence the 101.35 ha of habitat affected would represent less than 3% of the affected habitat patch. The project is therefore unlikely to interfere substantially with the recovery of the species.
Consideration of impacts from 2019–2020 bushfires.	The disturbance footprint and contiguous woodland across the locality were not affected by the 2019/20 bushfires. Accordingly, the project is not expected to contribute to the cumulative impacts of these fires on a population of the species.

Criteria	Assessment
Conclusion	**Likely significant impact.** Based on the assessment provided above and given a lack of scientific certainty of the importance of habitat provided in the construction envelope, the precautionary principle was applied by considering that the project is likely to have a significant impact on the Glossy Black Cockatoo.

13.2.8 Assessment of significance: White-throated Needletail (EPBC Act: Vulnerable)

Table 13.13 Assessment of significance: White-throated Needletail (EPBC Act: Vulnerable)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	**Unlikely.** An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range. The White-throated Needletail is a migratory species that exists as a series of interconnected subpopulations with animals moving between widely dispersed summer foraging areas in the southern hemisphere and breeding sites in the northern hemisphere (DCCEEW 2025c). The concept of an important population is not readily applicable to this species. For the purposes of this assessment important habitat has been used to assess whether an impact on an 'important population' is likely. Important habitat for the White-throated Needletail is likely to include productive landscapes with high flying insect activity, particularly open forests, and rainforests but also a wide variety of other habitat. The forests and woodlands that are prevalent in the construction envelope are likely to be suitable habitat. The species roosts in trees amongst dense foliage in the canopy or in hollows (TSSC 2019). The species is conspicuous, and the low density of records around Lake Lyell suggests that the locality is not frequently utilised by the species despite the presence of 101.35 ha of suitable habitat in the Construction envelope. The construction envelope is not at or near the limit of the species' range. Therefore, the project is unlikely to affect an important population of White-throated Needletail.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The IUCN recommends standardization of estimates of area of occupancy by applying a 2 km x 2 km grid to occurrence data, a method which is adopted in assessment of conservation status under the EPBC Act (TSSC 2015b). The project is unlikely to reduce area of occupancy of the species as defined a 2 km x 2 km grid applied to occurrence data as it will not result in the complete loss of potential habitat from any individual grid cell.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** Owing to the mobility of the species and the location of the site within the species distribution area. It is unlikely to fragment an existing important population into two or more populations.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** No critical habitat has been listed for this species under the EPBC Act. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • the reintroduction of populations or recovery of the species or ecological community (DoE 2013). The White-throated Needletail is a migratory species with animals moving between widely dispersed summer foraging areas in the southern hemisphere and breeding sites in the northern hemisphere. Important habitat for the White-throated Needletail in Australia is likely to include productive landscapes with high flying insect activity, particularly open forests and rainforests. The wet forests and woodlands that are present in the construction envelope may provide suitable foraging habitat (TSSC 2019). The presence of dense foliage in the canopy and suitable hollows on site may provide potential roosting habitat 101.35 ha of potential foraging and roosting habitat will be impacted. The species is conspicuous when flying high over open habitat, and the low density of local records suggests that the locality is not frequently utilised by the species. The project will impact 101.35 ha of potential foraging and roosting habitat of the White-throated Needletail. However, due to the low density of species records it is unlikely this habitat is critical to the survival of the species.
Would the action disrupt the breeding cycle of an important population?	**Unlikely.** The species does not breed in Australia (TSSC 2019). The potential habitat present in the impact area is possibly suitable for roosting and foraging for the species. However, due to the low density of species records it is unlikely the construction envelope contains important habitat. The project is not considered likely to disrupt the breeding cycle of an important population of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project may reduce potential White-throated Needletail habitat by up to 101.35 ha. The project is not likely to cause the species to decline, due to: • availability of larger area of similar habitat in the broader locality • the ability of the species to forage in fragmented landscapes (including agricultural landscapes) • no evidence of current utilisation of the construction envelope • the mobility of the species.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition or alteration of habitat. With the mitigation and management measures proposed, it is unlikely that any further species invasions will be facilitated by the project. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action interfere substantially with the recovery of the species?	**Unlikely.** No Recovery Plan or Listing Advice has been created for the White-throated Needletail. Conservation advice (TSSC 2019) lists conservation actions. The following is a subset of these actions, relevant to the project: • support initiatives to improve habitat management at key sites in Australia • ensure important habitats in Australia are identified and protected. Due to the low density of records in the locality, the project is unlikely to affect key or important habitat or otherwise interfere substantially with the recovery of the species.

Criteria	Discussion
Would the action introduce disease that may cause the species to decline?	**Unlikely.** Introduction of a disease that may cause the species to decline is unlikely. Prior to construction, site hygiene protocols will be prepared which will include minimisation and mitigation measures to prevent the spread of disease throughout the construction and operation of the project.
Consideration of impacts from 2019–2020 bushfires.	The disturbance footprint and contiguous woodland across the locality were not affected by the 2019/20 bushfires. Accordingly, the project is not expected to contribute to the cumulative impacts of these fires on locally occurring habitat of the species.
Conclusion	**Significant impact unlikely.** Based on the above assessment, the project is unlikely to cause a significant impact to White-throated Needletail.

13.2.9 Assessment of significance: Grey-headed Flying-fox (EPBC Act: Vulnerable)

Table 13.14 Grey-headed Flying-fox (EPBC Act: Vulnerable)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	**Unlikely.** The Grey-headed Flying-fox likely uses the site intermittently for foraging but there is no breeding known to occur within the construction envelope. There has been a low density of records within the locality and none in the construction envelope. The project would lead to a decrease in the habitat available for the species by up to 101.35 ha. The habitat affected consists of treed foraging habitat. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range. The Grey-headed Flying-fox exists as a series of interconnected subpopulations with animals moving between widely dispersed roosting and breeding sites (DAWE 2021x). The concept of an important population is not readily applicable to this species. For the purposes of this assessment important habitat has been used to assess whether an impact on an 'important population' is likely. Important habitat for the Grey-headed Flying-fox is likely to include camp sites used for roosting and breeding and extensive areas of forest and woodland, particularly those that contain tree species that flower or fruit in winter and spring when food resources for the species are generally scarce (DAWE 2021x). Important winter and spring vegetation communities are those that contain *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia* or *Syncarpia glomulifera* (DAWE 2021). Of these, Yellow Box *(Eucalyptus melliodora)* is known to occur on site. The nearest camp site for Grey-headed Flying-fox is in Bathurst, approximately 50km from the construction envelope (DCCEEW 2024). This site had between 500 to 2,499 individuals when last surveyed in 2022. Typically, the species forages within 15 km of roost sites but can travel up to 50km from roost sites for daily foraging (DoE 2024). There will be a reduction in foraging habitat by up to 101.35 ha. However, due to the lack of known utilisation of the site and its distance from known camp and roosting sites, it is unlikely the project will result in a long-term decrease in the size of an important population.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The IUCN recommends standardization of estimates of area of occupancy by applying a 2 km x 2 km grid to occurrence data, a method which is adopted in assessment of conservation status under the EPBC Act (TSSC 2015b). The project may reduce the area of occupancy of the species at a fine scale within the construction envelope but is unlikely to reduce the area of occupancy as defined by a 2 km x 2 km grid as the complete loss of potential habitat from any individual grid cell is unlikely to occur.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** Due to the mobility of this species, and its ability to traverse large areas of highly modified landscapes, the project is unlikely to fragment an existing important population into two or more populations.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** No critical habitat has been listed for the species under the EPBC Act. Habitat critical to the survival of the species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • the reintroduction of populations or recovery of the species or ecological community (DE 2013a). Winter and spring foraging resources are habitat critical to the survival of the species in the species recovery plan (DAWE 2021x). Important winter and spring vegetation communities are those that contain *Eucalyptus tereticornis, E. albens, E. crebra, E. fibrosa, E. melliodora, E. paniculata, E. pilularis, E. robusta, E. seeana, E. sideroxylon, E. siderophloia, Banksia integrifolia, Castanospermum australe, Corymbia citriodora citriodora, C. eximia, C. maculata, Grevillea robusta, Melaleuca quinquenervia* or *Syncarpia glomulifera* (DAWE 2021). Of these, Yellow Box *(Eucalyptus melliodora)* is known to occur on site. The loss of roosting habitat has also been identified as a threat to Grey-headed Flying-foxes (DAWE 2021). Roosts are typically located near water, such as lakes, rivers or the coast in vegetation including rainforest patches, stands of Melaleuca, mangroves and riparian vegetation (DCCEEW 2025c). No roosting habitat has been recorded in the construction envelope however riparian vegetation along Lake Lyell in the construction envelope may have potential as a roost site for the species. There will be a reduction in potential foraging habitat by up to 101.35 ha. However, due to the lack of known utilisation of the site and its distance from known camp and roosting sites, it is unlikely the project will affect habitat critical to the survival of the species.
Would the action disrupt the breeding cycle of an important population?	**Unlikely.** No camp sites (roosting and breeding habitat) for the Grey-headed Flying-fox were identified within or near to the construction envelope. The nearest known camp sites are at Bathurst, approximately 50 km to the West and Richmond approximately 65 km to the East. Due to the distance of the construction envelope from known roosting and breeding sites, it is unlikely to disrupt the breeding cycle of an important population of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project would reduce available foraging habitat by up to 101.35 ha however, this habitat is unlikely to be frequently utilised by the species. The project reduce the availability of potential habitat, but this is unlikely to cause species decline the affected habitat is unlikely to be frequently utilised. The project is not likely to cause the species to decline, due to the small proportion of available habitat likely to be impacted, distance from known camp and roosting sites, and small number of individuals recorded within the locality.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** The existing landscape contains invasive species that are directly or indirectly harmful to the species through predation, competition or alteration of habitat. Given the management measures proposed, it is unlikely that any further species invasions will be facilitated by the project. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the Grey-headed Flying-fox (either directly or indirectly).

Criteria	Discussion
Would the action interfere substantially with the recovery of the species?	**Unlikely** The National Recovery Plan for the Grey-headed Flying-fox outlines recovery objectives (DAWE 2021). The following is a subset of these objectives, targeting actions relevant to the project: • Identify, protect and increase native foraging habitat that is critical to the survival of the Grey-headed Flying-fox. • Reduce the impact on Grey-headed Flying-foxes of electrocution on power lines, and entanglement in netting and on barbed-wire. • Identify, protect and increase roosting habitat of Grey-headed Flying-fox camps. Minimising collision and electrocution hazards to animals will be considered in the design of the short overhead powerline connection with the existing transmission line, including the spacing and configuration of conductors. The resulting design is unlikely to pose a significant risk to Grey-headed Flying-foxes. The project may detract from the recovery of the species due to the removal of potential habitat but is unlikely to affect important or critical habitat. Due to the small proportion of available habitat likely to be impacted, and the lack of any evidence that the affected habitat is frequently utilised, the project is unlikely to substantially interfere with the recovery of the Grey-headed Flying-fox.
Consideration of impacts from 2019–2020 bushfires.	The disturbance footprint and contiguous woodland across the locality were not affected by the 2019/20 bushfires. The camp sites in Bathurst and adjacent to Richmond were also unaffected by the fires. Accordingly, the project is not expected to contribute to the cumulative impacts of these fires for a local population of the species.
Conclusion	**Significant impact unlikely.** Based on the above assessment, the project is unlikely to cause a significant impact to the Grey-headed Flying-fox.

13.2.10 Assessment of significance: Yellow-bellied Glider (south-eastern) (EPBC Act: Vulnerable)

Table 13.15 Yellow-bellied Glider (south-eastern) (EPBC Act: Vulnerable)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	**Unlikely.** The Yellow-bellied Glider may use the site intermittently for foraging but, based on the lack of records during field surveys, it is unlikely to be currently denning or breeding within the construction envelope. There has been a low density of records within the locality, in Gardens of Stone National Park, Winburndale Nature Reserve, with most records further to the south. and none in the connected habitats of Marrangaroo National Park nor Lidsdale State Forest. The project would lead to a decrease in the potential habitat available for the species by up to 105.17 ha. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range. The construction envelope is not within nor adjacent to any important population listed in the conservation advice for the species. There are no records of Yellow-bellied Glider in any of the lands within or with high connectivity to the habitat of the construction envelope. The locality in which the construction envelope is situated is not known or likely to be a stronghold for the species which is concentrated in more continuous areas of forest to the north and south. The habitat within the construction envelope is not likely support a key source population or a population necessary for maintaining genetic diversity. The construction envelope is in an area where the species has been infrequently recorded and is at least 20 km from the western edge of the species' range. Therefore, the project is unlikely to affect an important population of the Yellow-bellied Glider.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The construction envelope is unlikely to contain an important population of the Yellow-bellied Glider. The project is therefore unlikely to reduce the area of occupancy of an important population of the species.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** The construction envelope is unlikely to contain an important population of the Yellow-bellied Glider. The project is therefore unlikely to fragment an existing important population of the species into two or more populations.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** No critical habitat has been listed for the species under the EPBC Act. Habitat critical to the survival of the species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • the reintroduction of populations or recovery of the species or ecological community (DE 2013a). Habitat critical to the survival of the species includes: • large contiguous areas of floristically diverse eucalypt forest, which are dominated by winter-flowering and smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees • areas identified as refuges under future climate change scenarios • short or long-term post-fire refuges (i.e. unburnt habitat within or adjacent to recently burnt landscapes) that allow the species to persist, recover and recolonise burnt areas • habitat corridors required to facilitate dispersal of the subspecies between fragmented habitat patches and/or that enable recolonization or movement away from threats • areas in which some trees have evidence of use for sap extraction by Yellow-bellied Glider (south-eastern) (reference conservation advice). The 51.6 ha of potential habitat of the construction envelope is not dominated by winter-flowering eucalypts but in some areas is dominated by smooth-barked eucalypts, including mature living hollow-bearing trees and sap trees. The construction envelope and adjacent land does contain unburnt habitat but it is not within nor adjacent to recently burnt landscapes and is unlikely to be able to act as a fire refuge nor as a movement corridor as it is separated from other potential habitats by extensive areas of cleared land. No evidence of sap extraction by Yellow-bellied Glider was recorded in the construction envelope. The construction envelope is unlikely to contain habitat critical to the survival of the species.
Would the action disrupt the breeding cycle of an important population?	**Unlikely.** The construction envelope is unlikely to contain an important population of the Yellow-bellied Glider. The project is therefore unlikely to disrupt the breeding cycle of an important population of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The construction envelope is not known to contain a population of the Yellow-bellied Glider. The species may use the site intermittently for foraging but based on the lack of records during field surveys, it is unlikely to be currently denning or breeding within the construction envelope. There has been a low density of records within the locality and none in habitats connected to those of the construction envelope such as Marrangaroo National Park and Lidsdale State Forest. The project would result in a reduction in the availability potential habitat by up to 51.6 ha. The project is not likely to cause the species to decline, due to the small proportion of any local population in locality that may be impacted, and the lack of any evidence that the affected habitat is occupied by the species.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** The existing landscape contains invasive species that are directly or indirectly harmful to the species through predation, competition or alteration of habitat. Given the management measures proposed, it is unlikely that any further species invasions will be facilitated by the project. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the species (either directly or indirectly).

Criteria	Discussion
Would the action interfere substantially with the recovery of the species?	**Unlikely.** A recovery plan has not yet been prepared for the species. Conservation and management priorities are identified in the conservation advice for the species and include measures to address: • habitat loss, disturbance and modifications (including fire) • climate change • invasive species (including threats from grazing, trampling, predation). The project may detract from the recovery of the species due to the removal of some potential habitat. As the construction envelope is unlikely to support an important population or to contain habitat critical to the survival of a species, the loss of potential habitat from the project is unlikely to interfere substantially with the recovery of the species. Nor is the project likely to exacerbate climate-related nor invasive species impacts. The project is therefore unlikely to interfere substantially with the recovery of the species.
Consideration of impacts from 2019–2020 bushfires.	The construction envelope and contiguous woodland across the locality were not affected by the 2019/20 bushfires. Accordingly, the project is not expected to contribute to the cumulative impacts of these fires for a local population of the species. Given the lack of connectivity with burnt areas, and lack of records of the species, it is also unlikely to be acting as a fire refuge.
Conclusion	**Significant impact unlikely** Based on the above assessment, the project is unlikely to cause a significant impact to the Yellow-bellied Glider.

13.2.11 Assessment of significance: Sharp-tailed Sandpiper and Latham's Snipe (EPBC Act: Vulnerable)

Table 13.16 Assessment of significance: Sharp-tailed Sandpiper and Latham's Snipe (EPBC Act: Vulnerable)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	**Unlikely.** An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range. These species exist as a series of interconnected subpopulations with animals moving between widely dispersed roosting and breeding sites. The concept of an important population is not readily applicable to the species. For the purposes of this assessment important habitat has been used to assess whether an impact on an 'important population' is likely. Latham's snipe has a low density of sightings in the locality, likely foraging on the shores of Lake Lyell intermittently (ALA 2025.). The Sharp-tailed Sandpiper has one sighting within the locality and no sightings within the construction envelope or broader project area. Latham's Snipe and Sharp-tailed Sandpiper do not breed in Australia (DCCEEW 2024a, 2024b. Due to the highly mobile and migratory nature of both species (DCCEEW 2024a, 2024b), any populations occurring within the project area or locality are unlikely to be necessary for maintaining genetic diversity. Latham's Snipe and Sharp-tailed Sandpiper are found throughout much of NSW (ALA 2025) and birds within the project area would not be near the limit of the species range. The project area is unlikely to support high numbers of either species and is therefore unlikely to be important for breeding, maintaining genetic diversity or dispersal. Therefore, the project is unlikely to affect an important population of Latham's Snipe or Sharp-tailed Sandpiper.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The construction envelope is unlikely to contain an important population of the species. The project is therefore unlikely to reduce the area of occupancy of an important population of either of the species.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** The construction envelope is unlikely to contain an important population of the species. The project is therefore unlikely to fragment an existing important population of either of the species into two or more populations.
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely** Lake Lyell is not listed as nationally important habitat for migratory shorebirds in the National Directory of Important Migratory Shorebird Habitat (BirdLife Australia, 2020). Due to the low density of sightings of both species, it is likely the site is used intermittently as foraging habitat. It is unlikely that the project will adversely affect habitat critical for the survival of the species.
Would the action disrupt the breeding cycle of an important population?	**Unlikely** These species do not breed in Australia. Due to the low density of sightings of both species, it is likely the site is used intermittently as foraging habitat and is unlikely to be habitat critical to the breeding cycle of an important population. The project is not considered likely to disrupt the breeding cycle of an important population of the species.

Criteria	Discussion
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The modification of habitat around Lake Lyell is unlikely to reduce habitat suitability for the species. The altered hydrology of the reservoir as a result of the project is more likely to increase habitat suitability of the species through intermittent exposure of the substrate, providing additional foraging opportunities. Noise and light pollution during the construction and operational phases of the project may decrease availability of remaining habitat within the project area as sustained disturbances can prevent shorebirds from utilising affected areas (TSSC 2024 and references therein). The project is unlikely to impact habitat to the extent that the species is likely to decline.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** The Conservation advice for the Latham's Snipe (TSSC 2024) defines predatory interactions with wild cats and foxes as a direct threat to the species. It is considered highly likely that wild cats and foxes are already present throughout the lands of the project area. The Conservation advice for Sharp-tailed Sandpiper lists limiting the spread of cordgrass as management priority due to its role in wetland degradation. However, this species is associated with open tidal wetlands and is highly unlikely to establish within the project area (TSSC 2024). Prior to construction, site hygiene protocols will be prepared which will include minimisation and mitigation measures to prevent the spread of invasive species during construction and operation of the project. Accordingly, the impacts of the project are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of Latham's Snipe and Sharp-tailed Sandpiper (either directly or indirectly).
Would the action interfere substantially with the recovery of the species?	**Unlikely.** There is currently no National recovery plan for the Latham's Snipe or Sharp-tailed Sandpiper. Conservation advice for these species (DCCEEW 2024a, 2024b) lists conservation and management priorities. The following is a subset of these relevant to the project: • habitat loss caused by residential and commercial development • invasive species impacts. The project may result in the modification of a small area of suitable habitat (less than 50 sqm) around the foreshore of the existing reservoir but is likely to increase habitat suitability for the species once operational. Invasive species of significance (wild cats, foxes) are highly likely to already be present. It is unlikely that the project will interfere substantially with the recovery of the species.
Consideration of impacts from 2019–2020 bushfires.	The disturbance footprint and contiguous woodland across the locality were not affected by the 2019/20 bushfires. Accordingly, the project is not expected to contribute to the cumulative impacts of these fires for a local population of these species.
Conclusion	**Significant impact unlikely.** The project is unlikely to cause a significant impact to the Latham's Snipe or Sharp-tailed Sandpiper.

13.2.12 Assessment of significance: Painted Honeyeater (EPBC Act: Vulnerable)

Table 13.17 Painted Honeyeater (Vulnerable)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	**Unlikely.** The concept of an important population is not readily applicable to this species. For the purposes of this assessment important habitat has been used to assess whether an impact on an 'important population' is likely. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity; and/or • populations that are near the limit of the species range. The Painted Honeyeater is nomadic and occurs at low densities throughout its range. It is a specialist feeder of mistletoe fruit, preferably in the *Amyema* genus. It occasionally feeds on insects and nectar from mistletoe or eucalypts. The species prefers breeding sites where mistletoe prevalence and parasitism rates are high, as well as where mature trees are common. The species is most frequently recorded from the inland slopes of the Great Dividing Range and almost all records of breeding are from that region (Conservation advice). The species has been recorded infrequently in the Lithgow locality and potential habitat present in the construction envelope is marginal and unlikely to constitute potential breeding habitat. It is likely to be used intermittently for foraging. Similar potential foraging and breeding habitat is considered to be relatively abundant in the locality and the habitat of the construction envelope is considered to be of only moderate importance to the local occurrence of the species. The locality in which the subject land is situated is not known or likely to be frequently utilised by the species which is concentrated on the inland slopes region. The habitat within the construction envelope is not likely to support many individuals or to be necessary for maintaining genetic diversity. The subject land is in an area where the species has been infrequently recorded toward the east of its range, that is unlikely to be important for breeding. Therefore, the project is unlikely to affect an important population of Painted Honeyeater.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The project is unlikely to affect an important population of Painted Honeyeater. It is unlikely to reduce the area of occupancy of an important population of the species.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** Owing to the mobility of the species, the quality of the habitat and the location of the site within the species distribution area, the project is unlikely to affect an important population of Painted Honeyeater. It is unlikely to fragment an existing important population into two or more populations.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** No critical habitat has been listed for this species under the EPBC Act. Habitat critical to the survival of this species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development; or • the reintroduction of populations or recovery of the species or ecological community (DoE 2013). The locality in which the subject land is situated is not known or likely to be used for breeding or regular foraging for the species which are concentrated on the inland slopes of the Great Dividing Range. The 70.41 ha of potential habitat within the construction envelope is not likely to support many individuals or to be important for maintaining genetic diversity. The construction envelope is in an area where the species has been infrequently recorded toward the east of its range. Therefore, the project is unlikely to adversely affect habitat critical to the survival of the Painted Honeyeater.
Would the action disrupt the breeding cycle of an important population?	**Unlikely.** The subject land is unlikely to contain an important population of the species. The project is unlikely to disrupt the breeding cycle of an important population of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project would reduce available habitat by up to 70.41 ha and could result in a small reduction in the carrying capacity of the locality for the species. The project is not likely to cause the species to decline significantly, due to: • low likelihood that the species would forage frequently or breed in the affected habitat present • the mobility of the species • the small proportion of locally available habitat likely to be impacted.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition or alteration of habitat. With the mitigation and management measures proposed, it is unlikely that any further species invasions will be facilitated by the project. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action interfere substantially with the recovery of the species?	**Unlikely.** No Recovery Plan or Threat Abatement Plan has been created for the Painted Honeyeater. The following is a subset of the actions specified in the Conservation Advice, targeting actions relevant to the project which have not been specifically addressed above: • Conserve mature trees and mistletoe populations across the Painted Honeyeater's distribution. • Control firewood collection from areas occupied by Painted Honeyeaters. • Aside from clearing habitat likely to be utilised sporadically for foraging, the project will not interfere with any of the identified recovery actions or otherwise interfere with the recovery of the species. The project will not interfere substantially with any of the identified recovery actions for the Painted Honeyeater.
Conclusion	**Significant impact unlikely.** Based on the above assessment, the project is unlikely to cause a significant impact to the Painted Honeyeater.

13.2.13 Assessment of significance: Superb Parrot (EPBC Act: Vulnerable)

Table 13.18 Superb Parrot (Vulnerable)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	**Unlikely.** The species is considered to consist of a single population and at least part of the population of the Superb Parrot undertakes regular seasonal movements, vacating the breeding area after the conclusion of the breeding season, and then returning in spring, while others remain in the breeding areas throughout the year (DCCEEW 2025c). The concept of an important population is not readily applicable to this species. For the purposes of this assessment important habitat has been used to assess whether an impact on an 'important population' is likely. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity; and/or • populations that are near the limit of the species range. Key biodiversity areas have been identified for the Superb Parot and include: • Barmah-Millewa - Barmah Forest in Victoria and adjacent Millewa and Moira forests in NSW • Murrumbidgee Red Gums – stretches of the Murrumbidgee River west from Wagga Wagga and centred on Darlington Point, south of Griffith • South-west Slopes of New South Wales - Wagga Wagga to Orange, Boorowa and Yass to Queanbeyan, Livingstone National Park, Tarcutta, Gundagai, Tumut and Adelong (recovery plan). The species has been recorded very infrequently in the Lithgow locality and potential habitat (77.25 ha) present in the construction envelope is unlikely to constitute potential breeding habitat. It may be used intermittently for foraging. Similar potential foraging and breeding habitat is considered to be relatively abundant in the locality and the habitat of the construction envelope is considered to be of low importance to the species. The locality in which the subject land is situated is not known or likely to be frequently utilised by the species and is distant from identified key biodiversity areas for the species (recovery plan). The habitat within the construction envelope is not likely to support many individuals or to be necessary for maintaining genetic diversity. The subject land is in an area where the species has been infrequently recorded toward the east of its range, that is unlikely to be important for breeding. Therefore, the project is unlikely to affect an important population of the Superb Parrot.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The project is unlikely to affect an important population of Superb Parrot. It is unlikely to reduce the area of occupancy of an important population of the species.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** Owing to the mobility of the species, and the location of the project at the periphery of the species' distribution area in an area unlikely to contain an important population of Superb Parrot, it is unlikely to fragment an existing important population into two or more populations.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** Habitat critical to the survival of the Superb Parrot is considered to include: • Breeding habitat - riverine forests in the Riverina, and box-gum woodlands in the tablelands and slopes of Victoria, New South Wales and the Australian Capital Territory • Foraging habitat - All preferred foraging habitat during both breeding and non-breeding season • Habitat for the long-term maintenance of the species - Key biodiversity areas and potential suitable foraging and breeding habitats within the projected south-eastward range shift (recovery plan). The locality in which the subject land is situated is not known or likely to be used for breeding or regular foraging for the species and is not close to any key biodiversity areas identified for the species. The future bioclimatic core range of the Superb Parrot will likely centre around the ACT region and to the immediate north (recovery plan). Therefore, the construction envelope is not within the projected south-eastward range shift. Therefore, the project is unlikely to adversely affect habitat critical to the survival of the Superb Parrot.
Would the action disrupt the breeding cycle of an important population?	**Unlikely.** The subject land is unlikely to contain an important population of the species. The project is unlikely to disrupt the breeding cycle of an important population of the species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project would reduce available habitat by up to 77.25 ha and could result in a small reduction in the carrying capacity of the locality for the species. The project is not likely to cause the species to decline significantly, due to: • low likelihood that the species would forage frequently or breed in the affected habitat present • the mobility of the species • the small proportion of locally available habitat likely to be impacted.
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation, competition or alteration of habitat. With the mitigation and management measures proposed, it is unlikely that any further species invasions will be facilitated by the project. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action interfere substantially with the recovery of the species?	**Unlikely.** Strategies identified to achieve the species' recovery plan objectives include: • identify, protect, manage and strategically restore Superb Parrot breeding, foraging and movement habitats, at the local, regional and landscape scales • define, monitor, reduce and manage threats to the Superb Parrot at the local, regional and landscape scales • expand and sustain ecologically meaningful monitoring to track changes in Superb Parrot distribution, habitat use and population size, including developing and applying techniques to measure the success of recovery actions • improve understanding of Superb Parrot movement ecology across multiple scales to better target protection and restoration measures • engage local communities and stakeholders in Superb Parrot conservation • coordinate, review and report on Superb Parrot recovery progress Due to its location outside of any areas of critical or important habitat for the species, the project is unlikely to interfere substantially with any of the identified recovery actions for the Superb Parrot.
Conclusion	**Significant impact unlikely.** Based on the above assessment, the project is unlikely to cause a significant impact to the Superb Parrot.

13.2.14 Assessment of significance: Brown Treecreeper and Diamond Firetail (EPBC Act: Vulnerable)

Table 13.19 Assessment of significance: Brown Treecreeper (south-eastern) and Diamond Firetail (EPBC Act: Vulnerable)

Criteria	Discussion
Would the action lead to a long-term decrease in the size of an important population of a species?	**Unlikely.** An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range. There is a low density of records within the locality of the Brown Treecreeper and Diamond Firetail and one pre-existing record of diamond firetail within the project area despite both being relatively conspicuous species. It is therefore unlikely any population of either species that may occur is a key source population for breeding or dispersal or maintenance of genetic diversity. The construction envelope is not at or near the limit of the range of either species. The construction envelope is unlikely to contain an important population of either species. The project is unlikely to lead to a long-term decrease in the size of an important population of either species.
Would the action reduce the area of occupancy of an important population?	**Unlikely.** The IUCN recommends standardization of estimates of area of occupancy by applying a 2 km x 2 km grid to occurrence data, a method which is adopted in assessment of conservation status under the EPBC Act (TSSC 2015b). The project is unlikely to reduce area of occupancy of the species as defined as a 2 km x 2 km grid applied to occurrence data as it will not result in the complete loss of potential habitat from any individual grid cell. The construction envelope is unlikely to contain an important population of either species. The project is unlikely to lead reduce the area of occupancy of an important population of either species.
Would the action fragment an existing important population into two or more populations?	**Unlikely.** The area to be cleared for the project will remain surrounded by large tracts of remnant woodland to the east and west, with Marangaroo National Park to the north. While the project may impede movement immediately around the construction area, connectivity across this broader tract of contiguous woodland is expected to be retained. The construction envelope is unlikely to contain an important population of either species. The project is unlikely to action fragment an existing important population of either species into two or more populations.

Criteria	Discussion
Would the action adversely affect habitat critical to the survival of a species?	**Unlikely.** No critical habitat has been listed for the species under the EPBC Act. Habitat critical to the survival of the species may also include areas not listed on the Register of Critical Habitat if they are necessary for: • activities such as foraging, breeding, roosting, or dispersal • the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators) • to maintain genetic diversity and long-term evolutionary development, or • the reintroduction of populations or recovery of the species or ecological community (DE 2013a). Habitat critical to the survival of the Brown Treecreeper as listed in the Conservation advice (DCCEEW 2023) includes: • relatively undisturbed grassy woodland with native understory: – habitat structure should be quite open at ground level so that birds are able to feed on or near the ground and maintain vigilance against predators – the required degree of openness is mostly likely to be created by moderate levels of disturbance by fire and/or grazing • large living and dead trees for roosting, nesting and foraging • fallen timber for foraging • hollows in standing dead or live trees and tree stumps for nesting. Habitat critical to the survival of the Diamond Firetail as listed in the Conservation advice (DCCEEW 2023a) includes: • eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats • low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding • Drooping she-oak (Allocasuarina verticillata) within the Mt Lofty Ranges. The descriptions for critical habitat for these species are generic descriptions of the most suitable habitat for the species. While some of the 101.35 ha of potential habitat in the construction envelope shares some characteristics with areas described as critical habitat, it is unlikely to support a resident population of either species based on the very small number of records in the locality and the lack of detections of either species during surveys for the project. As only a small number of individuals are likely to intermittently utilise the construction envelope, the habitat affected is unlikely to be necessary for foraging, breeding, roosting, dispersal, genetic diversity, long-term evolutionary development, long-term population maintenance, re-introduction or recovery of the species. The project is unlikely to adversely affect habitat critical to the survival of the Brown Treecreeper or Diamon Firetail.
Would the action disrupt the breeding cycle of an important population?	**Unlikely.** Due to the low density of sightings of both species, it is unlikely that the site is utilised for breeding. The construction envelope is unlikely to contain an important population of either species. The project is unlikely to disrupt the breeding cycle of an important population of either species.
Would the action modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?	**Unlikely.** The project would remove up to 101.35 ha of habitat for Brown Treecreeper and Diamond firetail. It is likely the habitat within the construction envelope is utilised intermittently for foraging and by a low number of individuals of each species. It is unlikely the project would affect the Brown Treecreeper and Diamond Firetail to the extent they are likely to decline.

Criteria	Discussion
Would the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?	**Unlikely.** The existing landscape contains many invasive species that are directly or indirectly harmful to the species, either through predation (red foxes and wild cats), competition (rabbits) or alteration of habitat (exotic annual grasses) (DCCEEW 2023, 2023a). With the mitigation and management measures proposed, it is unlikely that any further species invasions will be facilitated by the project. Therefore, the proposed impacts are considered unlikely to facilitate the spread of invasive species or their adverse impacts to the survival of the threatened species (either directly or indirectly).
Would the action interfere substantially with the recovery of the species?	**Unlikely.** No National recovery plan has been published for the Brown Treecreeper or Diamond Firetail. Conservation advice for these species (DCCEEW 2023, 2023a) lists conservation and management priorities. The following is a subset of these relevant to the project: • Habitat loss caused by clearing for large scale agriculture: – Retain and protect woodland, open forest, grassland and mallee habitat clearing, fragmentation and disturbance (areas of 200 ha or greater within woody vegetation are particularly significant). • Invasive weeds, particularly exotic annual grasses, altering habitat. • noisy miner territorial competition. The project may interfere with conservation and management priorities by clearing up to 101.35 ha of potentially suitable habitat. Due to the low density of sightings of both species, it is unlikely that the clearing of habitat for the species as a result of the project would interfere substantially with the recovery of the species.
Consideration of impacts from 2019–2020 bushfires.	The disturbance footprint and contiguous woodland across the locality were not affected by the 2019/20 bushfires. Accordingly, the project is not expected to contribute to the cumulative impacts of these fires for a local population of these species.
Conclusion	**Significant impact unlikely.** The project is unlikely to cause a significant impact on Diamond Firetails or Brown Treecreeper (south-eastern).

13.2.15 Migratory species

As for threatened species, migratory species predicted to occur by the PMST were assessed in terms of their likelihood of occurring in the disturbance footprint. No listed migratory species under the EPBC Act were recorded within the construction envelope during survey for the project, however species that are considered likely to occur infrequently and sporadically, these are:

- Black-faced Monarch (*Monarcha melanopsis*)
- Fork-tailed Swift (*Apus pacificus*)
- Latham's Snipe (*Gallinago hardwickii*)
- Rufous Fantail (*Rhipidura rufifrons*)
- Satin Flycatcher (*Myiagra cyanoleuca*)
- Sharp-tailed Sandpiper (*Calidris acuminata*)
- White-throated Needletail (*Hirundapus caudacutus*).

Assessments of significance were prepared for the relevant species in accordance with the assessment criteria for migratory species (DoE 2013) in Table 13.20 to Table 13.22. The project is unlikely to result in a significant impact on migratory species.

Table 13.20 Assessment of significance for migratory forest bird species (Black-faced Monarch, Rufous Fantail, Satin Flycatcher)

Criteria	Discussion
1. Substantially modify important habitat	**Unlikely.** An area of 'important habitat' for a migratory species is defined as: a) habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or b) habitat that is of critical importance to the species at particular life-cycle stages, and/or c) habitat utilised by a migratory species which is at the limit of the species range, and/or d) habitat within an area where the species is declining (DoE 2013). Important sites have not been identified for any of these species. None of the species were recorded in the habitat in the construction envelope suggesting, in conjunction with the low density of previous records in the locality, that low numbers of species are likely to migrate through the area. It is not located in a region likely to support an ecologically significant proportion of the population of any of the species. It is unlikely to contain any features of particular importance to these species and is not in an area where any of the species are known to be in decline. Therefore, the project will not modify important habitat for migratory species.
2. Result in invasive species becoming established in an area of important habitat	**Unlikely.** The construction envelope is unlikely to contain important habitat for these species. The project is therefore unlikely to result in invasive species becoming established in an area of important habitat. Vegetation clearing and topsoil stripping have potential to lead to weed invasion in surrounding habitat, unless adequately mitigated. Measures to control weeds in retained habitats of the construction envelope will be undertaken to prevent weed establishment in retained habitat. With the proposed mitigation measures, the impact of the project on invasive species would be minimal.
3. Seriously disrupt the lifecycle of ecologically significant proportion of population	**Unlikely.** The construction envelope is unlikely to support an ecologically significant proportion of any population of the species. Therefore, the lifecycle of an ecologically significant proportion of the species will not be disrupted.
Conclusion	**Significant impact unlikely.** The project is unlikely to result in a significant impact on migratory species as: • the area does not contain important habitat for the species • it will not disrupt the life cycle of an ecologically significant proportion of any population.

Table 13.21 Assessment of significance for migratory aerial-foraging species (Fork-tailed Swift and - White-throated Needletail)

Criteria	Discussion
1. Substantially modify important habitat	**Unlikely.** An area of 'important habitat' for a migratory species is defined as: a) habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or b) habitat that is of critical importance to the species at particular life-cycle stages, and/or c) habitat utilised by a migratory species which is at the limit of the species range, and/or d) habitat within an area where the species is declining (DoE 2013). Important sites have not been identified for any of these species. Neither of the species were recorded foraging over the habitat in the construction envelope suggesting, in conjunction with the low density of previous records in the locality, that low numbers of species are likely to migrate through the area. Neither species breeds in Australia. The project is not located in a region likely to support an ecologically significant proportion of the population of any of the species. The Constriction Envelope unlikely is unlikely to contain any features of particular importance to these species, which both forage aerially over a wide variety of habitats and is not in an area where any of the species are known to be in decline. Therefore, the project will not modify important habitat for these migratory species.
2. Result in invasive species becoming established in an area of important habitat	**Unlikely.** The construction envelope is unlikely to contain important habitat for these species. The project is therefore unlikely to result in invasive species becoming established in an area of important habitat. Vegetation clearing and topsoil stripping have potential to lead to weed invasion in surrounding habitat, unless adequately mitigated. Measures to control weeds in retained habitats of the construction envelope will be undertaken to prevent weed establishment in retained habitat. With the proposed mitigation measures, the impact of the project on invasive species would be minimal.
3. Seriously disrupt the lifecycle of ecologically significant proportion of population	**Unlikely.** Based on the lack of records during surveys for the project and the small number of previous r3ecords of the species in the locality, the construction envelope is unlikely to support an ecologically significant proportion of either species. Therefore, the lifecycle of an ecologically significant proportion of the species will not be disrupted.
Conclusion	**Significant impact unlikely.** The project is unlikely to result in a significant impact on Fork-tailed Swift or White-throated Needletail as: • the area does not contain important habitat for the species • it will not disrupt the life cycle of an ecologically significant proportion of any population. A separate assessment of the White-throated Needletail under the criterial for listed Vulnerable species also concluded that potential impacts on the species are unlikely to be significant.

Table 13.22 Assessment of significance for migratory wetland species (Sharp-tailed Sandpiper and Latham's Snipe)

Criteria	Discussion
1. Substantially modify important habitat	**Unlikely.** An area of 'important habitat' for a migratory species is defined as: a) habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or b) habitat that is of critical importance to the species at particular life-cycle stages, and/or c) habitat utilised by a migratory species which is at the limit of the species range, and/or d) habitat within an area where the species is declining (DoE 2013). Important sites have not been identified for any of these species. Neither of the species were recorded foraging over the habitat in the construction envelope suggesting, in conjunction with the low density of previous records in the locality, that low numbers of species are likely to migrate through the area. Neither species breeds in Australia. The project is not located in a region likely to support an ecologically significant proportion of the population of any of the species. As discussed in the assessment of the species under the criteria for Vulnerable species (refer to Section 13.2.1), the Constriction Envelope unlikely is unlikely to contain any features of high importance to these species and is not in an area where any of the species are known to be in decline. Therefore, the project will not modify important habitat for these migratory species.
2. Result in invasive species becoming established in an area of important habitat	**Unlikely.** The construction envelope is unlikely to contain important habitat for these species. The project is therefore unlikely to result in invasive species becoming established in an area of important habitat. Vegetation clearing and topsoil stripping have potential to lead to weed invasion in surrounding habitat, unless adequately mitigated. Measures to control weeds in retained habitats of the construction envelope will be undertaken to prevent weed establishment in retained habitat. With the proposed mitigation measures, the impact of the project on invasive species would be minimal.
3. Seriously disrupt the lifecycle of ecologically significant proportion of population	**Unlikely.** Based on the lack of records during surveys for the project and the small number of previous records of the species in the locality, the construction envelope is unlikely to support an ecologically significant proportion of either species. Therefore, the lifecycle of an ecologically significant proportion of the species will not be disrupted.
Conclusion	**Significant impact unlikely.** The project is unlikely to result in a significant impact on (Sharp-tailed Sandpiper and Latham's Snipe) as: • the area is unlikely to contain important habitat for the species • it will not disrupt the life cycle of an ecologically significant proportion of any population.

13.3 Biosecurity Act 2015

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. Priority weeds with additional biosecurity duties are listed for specific weed management regions.

The list of priority weeds of the Central Tablelands that were recorded within the construction envelope and duty information is described in Table 13.23.

Table 13.23 Priority weeds

Weed	Duty
Blackberry (*Rubus fruticosus species aggregate*)	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value. Prohibition on certain dealings Must not be imported into the state, sold, bartered, exchanged or offered for sale. All species in the *Rubus fruiticosus* species aggregate have this requirement, except for the varietals Black Satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smooth Stem, and Thornfree.
Giant Parramatta grass (*Sporobolus fertilis*)	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should eradicate the plant from the land and keep the land free of the plant. A person should not deal with the plant, where dealings include but are not limited to buying, selling, growing, moving, carrying or releasing the plant. Notify local control authority if found.
Gorse (*Ulex europaeus*)	Regional Recommended Measure A core infestation area is established for Upper Macquarie County Council area (Lithgow Council, Bathurst Regional Council, Oberon Council and Blayney Council areas). Within the core infestation area: Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value. Prohibition on certain dealings Must not be imported into the state, sold, bartered, exchanged or offered for sale.
Fireweed (*Senecio madagascariensis*)	Regional Recommended Measure An exclusion zone is established for all lands in the Central Tablelands region except the identified core infestation area. A core infestation area is established for the Bylong Valley - Ulan and Kanimbla Valley (lower Cox River catchment) areas. Within exclusion zone: Land managers should mitigate the risk of the plant being introduced to their land. Land managers should eradicate the plant from the land and keep the land free of the plant. A person should not deal with the plant, where dealings include but are not limited to buying, selling, growing, moving, carrying or releasing the plant. Notify local control authority if found. Within core infestation area: Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value. Prohibition on certain dealings Must not be imported into the state, sold, bartered, exchanged or offered for sale.

Weed	Duty
Serrated tussock (*Nassella trichotoma*)	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value. Prohibition on certain dealings Must not be imported into the state, sold, bartered, exchanged or offered for sale.
St. John's wort (*Hypericum perforatum*)	Regional Recommended Measure Land managers should mitigate the risk of the plant being introduced to their land. Land managers should mitigate spread of the plant from their land. A person should not buy, sell, move, carry or release the plant into the environment. Land managers should reduce the impact of the plant on assets of high economic, environmental and/or social value.

Fireweed has a regional recommended measure, advising land managers to eradicate the plant from the land and keep the land free of the plant.

Blackberry, Gorse, Giant Parramatta Grass, and Serrated tussock have regional recommended measures, advising land managers to reduce the impact of the plant on assets of high economic, environmental and/or social value.

All priority weeds must not be imported into NSW sold, bartered, exchanged or offered for sale.

Conservation areas, natural environments and primary production lands should be prioritised for the control and eradication of priority weeds and other exotic plant species. The biodiversity management plan for the project would directly address the control of these weed species.

14 Conclusion

This BDAR has been prepared in accordance with the BAM (DPIE 2020a), biodiversity-related SEARs and the associated agency-specific assessment requirements.

Biodiversity surveys within the construction envelope were undertaken during 2023, 2024 and 2025. These were carried out in parallel with and informed the evolution of the development footprint design. This process has ensured the avoidance and minimisation of biodiversity constraints as far as practicable.

The construction envelope does not contain any threatened ecological communities, and no threatened plants were recorded there despite surveys having been undertaken in accordance with the BAM. Five threatened species credit species, Koala, South-eastern Glossy Black-Cockatoo, Gang-gang Cockatoo, Powerful Owl and Sooty Owl were recorded within the construction envelope. One additional threatened species credit species, the Purple Copper Butterfly, was assumed to be present.

The project requires 3,989 ecosystem credits to compensate for impacts on native PCTs and ecosystem credit species. In addition to ecosystem credits, the project also requires a total of 18,115 species credits. LLP will compensate for these residual impacts through the implementation of a biodiversity offset strategy, which prioritises seeking offset credits locally where time permits, before consulting the market and payment into the Biodiversity Conservation Fund.

The BDAR has also considered impacts on biodiversity listed under the EPBC Act. The project will have an adverse impact on habitat critical for the survival of threatened species and is likely to have a significant impact on the Koala, Gang-gang Cockatoo, and South-eastern Glossy Black-Cockatoo as defined under the EPBC Act. As the project is being assessed in accordance with the bilateral agreement made between the NSW and the Commonwealth under section 45 of the EPBC Act, impacts on this listed ecological community and listed species will be offset in accordance with the BAM through the implementation of the biodiversity offset strategy.

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Appendix A
BAM plot data

EMM
creating opportunities

BAM Site – Field Survey Form

Plot ID:	LL_Camp02	**Date:**	03/06/2024	**Project number:**	E221111	**Plot dimensions:**	20 x 50
Datum:	GDA94	**Easting:**	229,415	**Recorders:**	Ross Davey		
Zone:	56	**Northing:**	6,287,366	**IBRA region:**	Bathurst	**Midline bearing:**	135
Plant Community Type:	3367: Central Tableland Granites Grassy Box Woodland			**Condition class:**	DNG_Poor	**PCT % cleared:**	78.19%
Vegetation Formation:	Grassy Woodlands			**Veg. Class:**	Southern Tableland Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	61.4
	Forbs:	0.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		33.2

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	20	40	20	15	50
Average litter cover (%):	29				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	
Soil texture:		**Landform pattern:**	

Hilly terrain. Plot on a hillside sloping to the NE. Paul Rossington helped on this plot.

Plot Disturbance
Grazed, cleared, paddock

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Ross Davey	**Plot ID:**	LL_Camp02	**Date:**	06/03/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Eragrostis curvula (African Lovegrass)	20	400	no	HTE
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	60	4500	no	N
	Acetosella vulgaris (Sheep Sorrel)	10	600	no	HTE
	Nassella trichotoma (Serrated Tussock)	2	25	no	HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	1	10	no	HTE
Grass & grasslike (GG)	*Juncus planifolius*	0.5	10	no	N
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	0.2	40	no	N
	Hypericum perforatum subsp. veronense (St John's Wort)	0.1	20	no	E
	Echium plantagineum (Patterson's Curse)	0.1	15	no	E
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.5	40	no	N
	Setaria parviflora	0.1	30	no	E
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	10	no	N
	Dactylis glomerata (Cocksfoot)	0.1	30	no	E
	Rosa rubiginosa (Sweet Briar)	0.1	1	no	HTE
	Paspalum dilatatum (Paspalum)	0.1	30	no	HTE
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	20	no	N
Grass & grasslike (GG)	*Digitaria spp. (A Finger Grass)*	0.1	30	no	N

BAM Site – Field Survey Form

Plot ID:	LL_Camp03	**Date:**	03/06/2024	**Project number:**	E221111	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	229,526	**Recorders:**	Paul Rossington		
Zone:	56	**Northing:**	6,287,423	**IBRA region:**	Bathurst	**Midline bearing:**	112
Plant Community Type:		3367: Central Tableland Granites Grassy Box Woodland		**Condition class:**	DNG_Poor	**PCT % cleared:**	78.19%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Southern Tableland Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	3
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	61.1
	Forbs:	0.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		3.7

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	20	30	20	40	20
Average litter cover (%):	26				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	
Soil texture:		**Landform pattern:**	

Hillside plot. Ross Davey helped on this plot.

Plot Disturbance
Cleared, grazed, paddock.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington	**Plot ID:**	LL_Camp03	**Date:**	06/03/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	60	3500	no	N
	Dactylis glomerata (Cocksfoot)	30	1000	no	E
	Acetosella vulgaris (Sheep Sorrel)	0.5	200	no	HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	3	4	no	HTE
	Rosa rubiginosa (Sweet Briar)	0.1	1	no	HTE
	Nassella trichotoma (Serrated Tussock)	0.1	1	no	HTE
	Hypericum perforatum subsp. veronense (St John's Wort)	20	2000	no	E
	Hypochaeris radicata (Catsear)	0.1	50	no	E
	Echium plantagineum (Patterson's Curse)	0.4	100	no	E
Forb (FG)	*Geranium homeanum*	0.1	4	no	N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.1	1	no	N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	1	400	no	N
	Trifolium repens (White Clover)	0.3	200	no	E
	Hirschfeldia incana (Buchan Weed)	0.1	5	no	E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	3	no	E
	Plantago lanceolata (Lamb's Tongues)	0.1	5	no	E

BAM Site – Field Survey Form

Plot ID:	LL_Camp04	**Date:**	24/07/2024	**Project number:**	E221111	**Plot dimensions:**	20 x 20
Datum:	GDA94	**Easting:**	229,524	**Recorders:**	Paul Rossington		
Zone:	56	**Northing:**	6,287,157	**IBRA region:**	Bathurst	**Midline bearing:**	105
Plant Community Type:		3367: Central Tableland Granites Grassy Box Woodland		**Condition class:**	DEGH	**PCT % cleared:**	78.19%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Southern Tableland Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	2
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	15.1
	Forbs:	0.2
	Ferns:	0
	Other:	0
High Threat Weed cover:		62.6

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	60	30	80	50	20
Average litter cover (%):	48				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	
Soil texture:		**Landform pattern:**	

Rolling hills, granite-derived soil

Plot Disturbance
Cleared and grazed, mostly weeds

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington	**Plot ID:**	LL_Camp04	**Date:**	24/07/2024

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Eragrostis curvula (African Lovegrass)	60	3000		HTE
	Phalaris spp.	15	500		E
	Echium plantagineum (Patterson's Curse)	3	800		E
	Acetosella vulgaris (Sheep Sorrel)	0.6	300		HTE
	Bromus catharticus (Praire Grass)	0.1	3		E
Grass & grasslike (GG)	*Microlaena stipoides var. stipoides (Weeping Grass)*	15	2000		N
	Plantago lanceolata (Lamb's Tongues)	0.8	300		E
	Dactylis glomerata (Cocksfoot)	5	400		E
	Hirschfeldia incana (Buchan Weed)	0.2	40		E
	Hypericum perforatum subsp. veronense (St John's Wort)	0.3	100		E
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	3		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	20	2000		E
	Rubus fruticosus sp. agg. (Blackberry complex)	2	4		HTE
Forb (FG)	*Epilobium hirtigerum*	0.1	1		N
	Hypochaeris radicata (Catsear)	0.2	20		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	0.1	1		N
	Trifolium spp. (A Clover)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	LL_Camp05	**Date:**	24/07/2024	**Project number:**	E221111	**Plot dimensions:**	20 x 20
Datum:	GDA94	**Easting:**	229,588	**Recorders:**	Paul Rossington		
Zone:	56	**Northing:**	6,287,279	**IBRA region:**	Bathurst	**Midline bearing:**	136
Plant Community Type:		3367: Central Tableland Granites Grassy Box Woodland		**Condition class:**	DNG_Poor	**PCT % cleared:**	78.19%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Southern Tableland Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	2
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	90.2
	Forbs:	2.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		2.4

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	30	30	50	30	40
Average litter cover (%):	36				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	
Soil texture:		**Landform pattern:**	

Gently sloping terrain

Plot Disturbance
Cleared and grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington	**Plot ID:**	LL_Camp05	**Date:**	24/07/2024

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	90	8000		N
	Eragrostis curvula (African Lovegrass)	0.3	4		HTE
Forb (FG)	*Geranium solanderi (Native Geranium)*	2	400		N
	Nassella trichotoma (Serrated Tussock)	0.1	2		HTE
	Acetosella vulgaris (Sheep Sorrel)	2	200		HTE
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	3		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	1	200		E
	Plantago lanceolata (Lamb's Tongues)	0.2	50		E
	Hirschfeldia incana (Buchan Weed)	0.2	30		E
	Dactylis glomerata (Cocksfoot)	0.1	2		E
	Echium plantagineum (Patterson's Curse)	0.1	3		E
	Onopordum acanthium subsp. acanthium (Scotch Thistle)	0.2	5		E
	Modiola caroliniana (Red-flowered Mallow)	0.4	80		E
	Verbena litoralis	0.1	1		E
	Trifolium spp. (A Clover)	0.1	2		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	0.2	8		N

BAM Site – Field Survey Form

Plot ID:	LL_STM_01	**Date:**	23/07/2024	**Project number:**	E221111	**Plot dimensions:**	20x20m, 50x20m
Datum:	GDA94	**Easting:**	229,860	**Recorders:**	Paul Rossington		
Zone:	56	**Northing:**	6,288,524	**IBRA region:**	Bathurst	**Midline bearing:**	93
Plant Community Type:		3349: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DNG	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	1
	Grasses etc.:	8
	Forbs:	7
	Ferns:	1
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0.5
	Shrubs:	0.4
	Grasses etc.:	22.6
	Forbs:	0.8
	Ferns:	0.1
	Other:	0.5
High Threat Weed cover:		1.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	8
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	20	10	30	30	20
Average litter cover (%):	22				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Lower slope
Soil texture:	Sandy loam	**Landform pattern:**	Hills

Road corridor with steep incline

Plot Disturbance

Disturbed, high weed invasion

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington	**Plot ID:**	LL_STM_01	**Date:**	23/07/2024

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	4	600		N
Grass & grasslike (GG)	*Austrostipa scabra (Speargrass)*	8	800		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	0.4	1		N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	0.4	1		N
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	0.1	1		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.5	15		N
	Acetosa sagittata (Rambling Dock)	0.3	100		HTE
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	10	400		N
	Verbascum virgatum (Twiggy Mullein)	0.1	10		E
	Eragrostis curvula (African Lovegrass)	0.1	2		HTE
Forb (FG)	*Lysimachia vulgaris var. davurica (Yellow Loosestrife)*	0.2	200		N
	Solanum nigrum (Black-berry Nightshade)	0.1	2		E
	Hypericum perforatum subsp. veronense (St John's Wort)	0.2	30		E
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	100		E
Forb (FG)	*Vittadinia cuneata (A Fuzzweed)*	0.1	6		N
Grass & grasslike (GG)	*Cyperus polystachyos*	0.1	3		N
Forb (FG)	*Einadia nutans (Climbing Saltbush)*	0.1	1		N
	Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)	0.1	1		E
	Hirschfeldia incana (Buchan Weed)	0.1	5		E
Forb (FG)	*Wahlenbergia spp. (Bluebell)*	0.1	3		N
Forb (FG)	*Crassula sieberiana (Australian Stonecrop)*	0.1	20		N
	Trifolium spp. (A Clover)	10	400		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	3	200		E
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	20		N
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.1	8		N
	Plantago lanceolata (Lamb's Tongues)	0.2	30		E
Grass & grasslike (GG)	*Panicum decompositum (Native Millet)*	0.1	1		N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	1		N
	Pyracantha spp.	1	1		HTE
Grass & grasslike (GG)	*Cymbopogon refractus (Barbed Wire Grass)*	0.2	10		N
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.1	4		N
Forb (FG)	*Lepidium pseudotasmanicum*	0.1	1		N
	Hypochaeris radicata (Catsear)	1	600		E

BAM Site – Field Survey Form

Plot ID:	LL_STM_02	**Date:**	23/07/2024	**Project number:**	E221111	**Plot dimensions:**	40x10m, 100x10m
Datum:	GDA94	**Easting:**	230,377	**Recorders:**	Paul Rossington		
Zone:	56	**Northing:**	6,288,592	**IBRA region:**	Bathurst	**Midline bearing:**	275
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	Moderate	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	3
	Grasses etc.:	6
	Forbs:	9
	Ferns:	0
	Other:	4
Sum of Cover of native vascular plants by growth form group	Trees:	25
	Shrubs:	40.2
	Grasses etc.:	50.6
	Forbs:	4.4
	Ferns:	0
	Other:	2.3
High Threat Weed cover:		0.4

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	72
80 + cm:	0		
50 – 79 cm:	4		
30 – 49 cm:	7		
20 – 29 cm:	1	**Tree hollow count**	1
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	90	90	70	90	80
Average litter cover (%):	84				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Lower slope
Soil texture:	Sandy loam	**Landform pattern:**	Upper slope

Road corridor

Plot Disturbance
Disturbed, high weed invasion

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington	**Plot ID:**	LL_STM_02	**Date:**	23/07/2024

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	25	10		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	40	25		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	50	2000		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	1	4		N
	Solanum nigrum (Black-berry Nightshade)	0.1	2		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	10	300		E
Forb (FG)	*Einadia hastata (Berry Saltbush)*	2	20		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.8	30		N
Grass & grasslike (GG)	*Themeda triandra*	0.1	2		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	2		N
Other (OG)	*Amyema miquelii (Box Mistletoe)*	2	11		N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	4		N
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
	Dactylis glomerata (Cocksfoot)	0.1	2		E
	Hypochaeris radicata (Catsear)	0.1	7		E
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	1		HTE
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	1		N
Forb (FG)	*Ajuga australis (Austral Bugle)*	0.1	1		N
	Hypericum perforatum subsp. veronense (St John's Wort)	0.1	3		E
Forb (FG)	*Cynoglossum australe*	0.1	4		N
Shrub (SG)	*Cassinia aculeata (Dolly Bush)*	0.1	1		N
	Bromus catharticus (Praire Grass)	0.1	1		E
Grass & grasslike (GG)	*Rytidosperma fulvum (Wallaby Grass)*	0.2	40		N
	Eragrostis curvula (African Lovegrass)	0.2	4		HTE
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.1	1		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	1		N
Shrub (SG)	*Rubus parvifolius (Native Raspberry)*	0.1	1		N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.1	1		N
Forb (FG)	*Oxalis perennans*	0.1	6		N
	Phytolacca americana (Poke Root)	0.1	2		E
Other (OG)	*Desmodium varians (Slender Tick-trefoil)*	0.1	1		N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	2		N
	Hirschfeldia incana (Buchan Weed)	0.1	1		E
Grass & grasslike (GG)	*Carex breviculmis*	0.1	1		N
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	1		E
	Acetosa sagittata (Rambling Dock)	0.1	20		HTE

BAM Site – Field Survey Form

Plot ID:	LLAR03	**Date:**	22/08/2023	**Project number:**	E221111	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	229,761	**Recorders:**	Bianca Seal, Maya Potapow		
Zone:	56	**Northing:**	6,288,410	**IBRA region:**	Bathurst	**Midline bearing:**	251
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	Moderate	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	3
	Grasses etc.:	10
	Forbs:	10
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	11.5
	Shrubs:	1.2
	Grasses etc.:	1.2
	Forbs:	1.9
	Ferns:	0
	Other:	0.2
High Threat Weed cover:		0.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	28
80 + cm:	0		
50 – 79 cm:	1		
30 – 49 cm:	6		
20 – 29 cm:	11	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	50	75	60	60	50
Average litter cover (%):	59				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		Landform element:	
Soil texture:		Landform pattern:	

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Bianca Seal, Maya Potapow	**Plot ID:**	LLAR03	**Date:**	22/08/2023

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	1	10		N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	10	5		N
	Dactylis glomerata (Cocksfoot)	15	500		E
Forb (FG)	*Senecio quadridentatus (Cotton Fireweed)*	0.1	80		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	50		N
Other (OG)	*Amyema spp. (Mistletoe)*	0.1	4		N
	Echium vulgare (Viper's Bugloss)	0.1	50		E
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	100		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	40	1000		E
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	1	4		N
	Conyza spp. (A Fleabane)	0.1	40		E
Forb (FG)	*Oxalis perennans*	0.1	10		N
Forb (FG)	*Rumex spp. (Dock)*	0.1	20		N
	Cyperus eragrostis (Umbrella Sedge)	0.1	40		HTE
Forb (FG)	*Asteraceae indeterminate (Daisies)*	0.1	50		N
	Hypochaeris radicata (Catsear)	0.1	50		E
	Acetosella vulgaris (Sheep Sorrel)	0.1	20		HTE
Forb (FG)	*Dianella spp.*	1	200		N
	Fumaria bastardii (Bastards Fumitory)	0.1	20		E
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	10		HTE
Forb (FG)	*Taraxacum spp. (Dandelion)*	0.1	20		N
	Cirsium vulgare (Spear Thistle)	0.1	20		E
	Hypericum perforatum (St. Johns Wort)	0.1	40		HTE
Tree (TG)	*Eucalyptus rubida (Candlebark)*	0.5	1		N
Grass & grasslike (GG)	*Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)*	0.2	50		N
	Verbascum spp.	0.1	10		E
Forb (FG)	*Vittadinia muelleri (A Fuzzweed)*	0.1	10		N
Shrub (SG)	*Exocarpos cupressiformis (Cherry Ballart)*	0.1	1		N
Grass & grasslike (GG)	*Themeda triandra*	0.1	10		N
Shrub (SG)	*Solanum chenopodinum*	0.1	40		N
Grass & grasslike (GG)	*Carex spp.*	0.1	100		N
Grass & grasslike (GG)	*Rytidosperma pilosum (Smooth-flowered Wallaby Grass)*	0.1	20		N
Grass & grasslike (GG)	*Rytidosperma setaceum (Small-flowered Wallaby-grass)*	0.2	100		N
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	0.1	40		N
Other (OG)	*Hardenbergia spp.*	0.1	10		N
Grass & grasslike (GG)	*Cymbopogon refractus (Barbed Wire Grass)*	0.1	10		N
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	50		E
	Salvia verbenaca (Vervain)	0.1	40		E
	Sonchus oleraceus (Common Sowthistle)	0.1	20		E
	Verbena bonariensis (Purpletop)	0.1	40		E
	Lactuca serriola (Prickly Lettuce)	0.1	50		E
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	0.1	20		N
	Centaurium spp.	0.1	50		E

Project name:	E221111				
Recorders:	Bianca Seal, Maya Potapow	**Plot ID:**	LLAR03	**Date:**	22/08/2023

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	20		N
	Cynosurus echinatus (Rough Dog's Tail)	0.1	10		E
Grass & grasslike (GG)	*Setaria spp.*	0.1	10		N
Forb (FG)	*Acaena spp. (Sheep's Burr)*	0.1	10		N

BAM Site – Field Survey Form

Plot ID:	LLAR04	**Date:**	22/08/2023	**Project number:**	E221111	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	229,649	**Recorders:**	Bianca Seal, Maya Potapow		
Zone:	56	**Northing:**	6,288,459	**IBRA region:**	Bathurst	**Midline bearing:**	129
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	Moderate	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	3
	Grasses etc.:	10
	Forbs:	8
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	1.3
	Shrubs:	1.2
	Grasses etc.:	1.8
	Forbs:	0.9
	Ferns:	0.1
	Other:	0
High Threat Weed cover:		90.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	33
80 + cm:	0		
50 – 79 cm:	4		
30 – 49 cm:	2		
20 – 29 cm:	2	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	90	10	80	10	30
Average litter cover (%):	44				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		Landform element:	
Soil texture:		Landform pattern:	

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Bianca Seal, Maya Potapow	**Plot ID:**	LLAR04	**Date:**	22/08/2023

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Pinus radiata (Radiata Pine)	35	2		HTE
	Vinca major (Periwinkle)	55	2000		HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	10		HTE
Shrub (SG)	*Solanum chenopodinum*	0.1	4		N
	Dactylis glomerata (Cocksfoot)	5	200		E
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.1	50		N
Grass & grasslike (GG)	*Setaria spp.*	0.5	200		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	10	2000		E
	Plantago lanceolata (Lamb's Tongues)	0.1	50		E
	Hypericum perforatum (St. Johns Wort)	0.1	50		HTE
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	0.1	20		N
	Poaceae indeterminate (Grasses, reeds and bamboos)	0.5	2000		E
	Cerastium glomeratum (Mouse-ear Chickweed)	0.1	10		E
	Hypochaeris radicata (Catsear)	0.1	20		E
	Hirschfeldia incana (Buchan Weed)	0.1	10		E
	Nassella trichotoma (Serrated Tussock)	0.1	10		HTE
Shrub (SG)	*Acacia spp. (Wattle)*	1	10		N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	0.2	50		N
	Acetosella vulgaris (Sheep Sorrel)	0.1	50		HTE
	Foeniculum vulgare (Fennel)	0.1	5		E
Tree (TG)	*Eucalyptus rubida (Candlebark)*	1	2		N
	Echium vulgare (Viper's Bugloss)	0.1	100		E
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	50		N
Grass & grasslike (GG)	*Rytidosperma setaceum (Small-flowered Wallaby-grass)*	0.1	50		N
	Phytolacca octandra (Inkweed)	0.1	10		E
Shrub (SG)	*Cassinia spp.*	0.1	2		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	10		N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	0.2	1		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	0.5	100		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.1	20		N
Grass & grasslike (GG)	*Carex spp.*	0.1	100		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	10		N
	Cirsium vulgare (Spear Thistle)	0.1	10		E
Grass & grasslike (GG)	*Rytidosperma fulvum (Wallaby Grass)*	0.1	4		N
Grass & grasslike (GG)	*Cynodon spp.*	0.1	50		N
Forb (FG)	*Senecio quadridentatus (Cotton Fireweed)*	0.1	10		N
Tree (TG)	*Eucalyptus radiata (Narrow-leaved Peppermint)*	0.1	1		N
	Briza maxima (Quaking Grass)	0.1	50		E
	Sonchus oleraceus (Common Sowthistle)	0.1	20		E
Forb (FG)	*Erodium spp. (Crowfoot)*	0.1	50		N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	20		N
Forb (FG)	*Asteraceae indeterminate (Daisies)*	0.1	80		N
	Conyza spp. (A Fleabane)	0.1	100		E

Project name:	E221111				
Recorders:	Bianca Seal, Maya Potapow	**Plot ID:**	LLAR04	**Date:**	22/08/2023

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Veronica spp.*	0.1	60		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	50		N
	Petrorhagia nanteuilii (Proliferous Pink)	0.1	20		E
	Trifolium spp. (A Clover)	0.1	10		E

BAM Site – Field Survey Form

Plot ID:	LLAR05	**Date:**	22/08/2023	**Project number:**	E221111	**Plot dimensions:**	10 x 100
Datum:	GDA94	**Easting:**	231,061	**Recorders:**	MP & BS		
Zone:	56	**Northing:**	6,288,420	**IBRA region:**	Bathurst	**Midline bearing:**	247
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DEGH	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	4
	Forbs:	4
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	36.1
	Forbs:	0.5
	Ferns:	0
	Other:	0
High Threat Weed cover:		6.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	0	2	1	1	1
Average litter cover (%):	1				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	
Soil texture:		**Landform pattern:**	

Mown road side

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	MP & BS	**Plot ID:**	LLAR05	**Date:**	22/08/2023

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	25	1000		N
	Plantago lanceolata (Lamb's Tongues)	0.1	20		E
	Trifolium subterraneum (Subterranean Clover)	0.2	20		E
	Gamochaeta purpurea (Purple Cudweed)	0.1	5		E
	Romulea rosea	5	1000		HTE
	Dactylis glomerata (Cocksfoot)	1	40		E
	Poa annua (Winter Grass)	20	1000		E
	Arenaria leptoclados (Lesser Thyme-leaved Sandwort)	0.1	20		E
Grass & grasslike (GG)	*Carex spp.*	1	100		N
	Facelis retusa	0.1	1		E
	Cerastium glomeratum (Mouse-ear Chickweed)	0.1	10		E
	Veronica persica (Creeping Speedwell)	0.2	50		E
Grass & grasslike (GG)	*Sporobolus creber (Slender Rat's Tail Grass)*	10	1000		N
	Echium vulgare (Viper's Bugloss)	0.2	50		E
	Vulpia spp. (Rat's-tail Fescue)	3	500		E
	Eleusine tristachya (Goose Grass)	5	1000		E
	Hypericum perforatum (St. Johns Wort)	0.1	5		HTE
	Trifolium repens (White Clover)	1	100		E
	Taraxacum officinale (Dandelion)	0.3	100		E
Forb (FG)	*Oxalis perennans*	0.1	30		N
	Modiola caroliniana (Red-flowered Mallow)	0.1	20		E
	Sonchus oleraceus (Common Sowthistle)	0.2	50		E
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.2	20		N
	Richardia spp.	0.2	50		E
	Verbena bonariensis (Purpletop)	0.1	10		E
	Bromus catharticus (Praire Grass)	0.1	10		E
	Hirschfeldia incana (Buchan Weed)	0.1	5		E
	Cirsium vulgare (Spear Thistle)	0.2	50		E
Forb (FG)	*Crassula spp. (Stonecrop)*	0.1	20		N
	Cyperus eragrostis (Umbrella Sedge)	0.2	10		HTE
	Sporobolus africanus (Parramatta Grass)	1	20		E
	Soliva sessilis (Bindyi)	0.1	10		E
Grass & grasslike (GG)	*Paspalum spp.*	0.1	1		N
Forb (FG)	*Senecio quadridentatus (Cotton Fireweed)*	0.1	1		N
	Polycarpon tetraphyllum (Four-leaved Allseed)	0.1	15		E
	Acetosella vulgaris (Sheep Sorrel)	1	50		HTE
	Lactuca spp.	0.1	1		E
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	1		HTE
	Conyza spp. (A Fleabane)	0.1	1		E
	Gamochaeta spp.	1	50		E
	Veronica arvensis (Wall Speedwell)	0.1	50		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	2	50		E
	Cardamine hirsuta (Common Bittercress)	0.5	50		E

Project name:	E221111				
Recorders:	MP & BS	Plot ID:	LLAR05	Date:	22/08/2023

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE

BAM Site – Field Survey Form

Plot ID:	LLAR06	**Date:**	22/08/2023	**Project number:**	E221111	**Plot dimensions:**	8x40
Datum:	GDA94	**Easting:**	231,052	**Recorders:**	Bianca Seal, Maya Potapow		
Zone:	56	**Northing:**	6,288,406	**IBRA region:**	Bathurst	**Midline bearing:**	256
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DEGH	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	5
	Forbs:	2
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0.1
	Shrubs:	0
	Grasses etc.:	4.8
	Forbs:	0.2
	Ferns:	0
	Other:	0
High Threat Weed cover:		95.6

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	2
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	65	60	10	20	85
Average litter cover (%):	48				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		Landform element:	
Soil texture:		Landform pattern:	

Plot Disturbance
Plot on roadside. Fit as best as possible. 100 mtr transect.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Bianca Seal, Maya Potapow	**Plot ID:**	LLAR06	**Date:**	22/08/2023

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Pinus radiata (Radiata Pine)	80	0		HTE
	Taraxacum officinale (Dandelion)	0.2	200		E
	Conyza spp. (A Fleabane)	0.1	100		E
	Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)	0.1	10		E
	Hypochaeris radicata (Catsear)	0.1	100		E
	Sporobolus fertilis (Giant Parramatta Grass)	15	1000		HTE
	Hypericum perforatum (St. Johns Wort)	0.1	100		HTE
	Verbena bonariensis (Purpletop)	0.1	20		E
	Plantago lanceolata (Lamb's Tongues)	0.1	50		E
	Eleusine tristachya (Goose Grass)	1	200		E
	Modiola caroliniana (Red-flowered Mallow)	0.2	100		E
	Richardia spp.	0.1	100		E
Tree (TG)	*Acacia melanoxylon (Blackwood)*	0.1	1		N
	Dactylis glomerata (Cocksfoot)	1	100		E
	Cotoneaster spp.	0.1	10		HTE
Forb (FG)	*Alternanthera nana (Hairy Joyweed)*	0.1	10		N
	Cirsium vulgare (Spear Thistle)	0.1	50		E
	Lepidium bonariense (Argentine Peppercress)	0.1	20		E
Grass & grasslike (GG)	*Cynodon spp.*	4	1000		N
	Nassella trichotoma (Serrated Tussock)	0.1	10		HTE
	Sporobolus africanus (Parramatta Grass)	25	500		E
	Gamochaeta spp.	0.1	10		E
	Oenothera indecora subsp. bonariensis	0.1	4		E
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	0.1	10		N
	Sonchus oleraceus (Common Sowthistle)	0.1	100		E
Forb (FG)	*Oxalis perennans*	0.1	80		N
	Vulpia spp. (Rat's-tail Fescue)	0.1	100		E
	Veronica arvensis (Wall Speedwell)	0.1	100		E
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	10		N
	Medicago laciniata (Cut-leaved Medic)	0.1	20		E
	Cardamine hirsuta (Common Bittercress)	0.1	100		E
	Bromus catharticus (Praire Grass)	0.1	10		E
	Polycarpon tetraphyllum (Four-leaved Allseed)	0.1	40		E
Grass & grasslike (GG)	*Carex spp.*	0.5	200		N
	Ehrharta erecta (Panic Veldtgrass)	0.1	10		HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	10		HTE
	Acetosella vulgaris (Sheep Sorrel)	0.1	10		HTE
	Anthoxanthum odoratum (Sweet Vernal Grass)	1	500		E
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.1	60		N

BAM Site – Field Survey Form

Plot ID:	LLC01	**Date:**	03/06/2024	**Project number:**	E221111	**Plot dimensions:**	20x50, 20x20
Datum:	GDA94	**Easting:**	229,387	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,287,520	**IBRA region:**	Bathurst	**Midline bearing:**	138
Plant Community Type:		3347: Southern Tableland Creekflat Ribbon Gum Forest		**Condition class:**	Sedge	**PCT % cleared:**	65.00%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	2
	Forbs:	1
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	80.4
	Forbs:	0.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		6

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	20	30	20	100	20
Average litter cover (%):	38				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	
Soil texture:		**Landform pattern:**	

Gently sloping drainage depression

Plot Disturbance

cleared, grazed, weed infested

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	LLC01	**Date:**	06/03/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	80	500		N
	Ranunculus repens (Creeping Buttercup)	2	5		HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	4	12		HTE
	Conyza sumatrensis (Tall fleabane)	0.3	8		E
	Verbena bonariensis (Purpletop)	0.1	5		E
	Phalaris aquatica (Phalaris)	2	200		E
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	0.4	6		N
	Bromus catharticus (Praire Grass)	0.1	2		E
	Cirsium vulgare (Spear Thistle)	0.4	8		E
Forb (FG)	*Geranium homeanum*	0.1	5		N
	Taraxacum officinale (Dandelion)	0.1	1		E
	Conium maculatum (Hemlock)	0.2	3		E
	Cichorium intybus (Chicory)	0.1	1		E
	Rumex crispus (Curled Dock)	0.1	1		E
	Solanum chenopodioides (Whitetip Nightshade)	0.1	1		E
	Sonchus oleraceus (Common Sowthistle)	0.1	2		E
	Plantago lanceolata (Lamb's Tongues)	0.1	5		E
	Dactylis glomerata (Cocksfoot)	0.2	8		E

BAM Site – Field Survey Form

Plot ID:	MHR01	**Date:**	30/01/2025	**Project number:**	E221111	**Plot dimensions:**	90x10
Datum:	GDA94	**Easting:**	231,624	**Recorders:**	Callan Douchkov,Paul Rossington		
Zone:	56	**Northing:**	6,288,927	**IBRA region:**	Bathurst	**Midline bearing:**	60
Plant Community Type:		3650: Goulburn-Lithgow Ranges Silvertop Ash Forest		**Condition class:**	Moderate	**PCT % cleared:**	6.46%
Vegetation Formation:		Dry Sclerophyll Forests (Shrubby sub-formation)		**Veg. Class:**	South East Dry Sclerophyll Forests		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	10
	Grasses etc.:	9
	Forbs:	9
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	33
	Shrubs:	33.1
	Grasses etc.:	22.4
	Forbs:	0.9
	Ferns:	0
	Other:	0.6
High Threat Weed cover:		1.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	5
80 + cm:	1		
50 – 79 cm:	4		
30 – 49 cm:	7		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	12	80	20	100
Average litter cover (%):	43.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Crest
Soil texture:		**Landform pattern:**	Hills

Roadside easement upon sandstone ledge

Plot Disturbance

Previously cleared/ disturbed for road construction. Blackberry patches throughout.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Callan Douchkov,Paul Rossington	**Plot ID:**	MHR01	**Date:**	30/01/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus sieberi (Silvertop Ash)*	30	20	no	N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	3	2	no	N
Shrub (SG)	*Acacia obtusifolia*	15	50	no	N
Shrub (SG)	*Leptospermum continentale (Prickly Teatree)*	2	20	no	N
	Prunus spp.	1	1	no	E
	Crataegus spp.	0.6	2	no	E
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	3	no	N
Grass & grasslike (GG)	*Rytidosperma spp.*	1	400	no	N
	Plantago lanceolata (Lamb's Tongues)	0.1	30	no	E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	20	5000	no	N
	Hypericum perforatum (St. Johns Wort)	0.1	20	no	HTE
Forb (FG)	*Tricoryne spp.*	0.1	2	no	N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.3	300	no	E
Forb (FG)	*Oxalis perennans*	0.1	8	no	N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	0.2	6	no	N
	Hypochaeris radicata (Catsear)	0.1	20	no	E
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	0.1	7	no	N
Grass & grasslike (GG)	*Echinopogon ovatus (Forest Hedgehog Grass)*	0.1	2	no	N
Shrub (SG)	*Rubus parvifolius (Native Raspberry)*	0.1	1	no	N
Grass & grasslike (GG)	*Themeda triandra*	0.3	15	no	N
Grass & grasslike (GG)	*Hemarthria uncinata (Matgrass)*	0.1	1	no	N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	2	no	N
	Centaurium spp.	0.1	10	no	E
	Cirsium vulgare (Spear Thistle)	0.1	1	no	E
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	4	no	N
	Verbena bonariensis (Purpletop)	0.1	2	no	E
	Sonchus oleraceus (Common Sowthistle)	0.1	1	no	E
	Dactylis glomerata (Cocksfoot)	0.2	50	no	E
	Phalaris aquatica (Phalaris)	0.2	70	no	E
	Pinus radiata (Radiata Pine)	1	1	no	HTE
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	2	no	N
Forb (FG)	*Stypandra glauca (Nodding Blue Lily)*	0.1	1	no	N
Shrub (SG)	*Ozothamnus diosmifolius (White Dogwood)*	0.2	4	no	N
Grass & grasslike (GG)	*Lomandra spp. (Mat-rush)*	0.5	100	no	N
	Eragrostis curvula (African Lovegrass)	0.1	2	no	HTE
Forb (FG)	*Senecio quadridentatus (Cotton Fireweed)*	0.1	2	no	N
	Conyza spp. (A Fleabane)	0.1	1	no	E
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	2	no	N
Grass & grasslike (GG)	*Digitaria spp. (A Finger Grass)*	0.1	5	no	N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	15	40	no	N
	Cotoneaster spp.	0.1	2	no	HTE
Other (OG)	*Glycine clandestina (Twining glycine)*	0.3	20	no	N
Forb (FG)	*Coronidium scorpioides (Button Everlasting)*	0.1	1	no	N

Project name:	E221111				
Recorders:	Callan Douchkov,Paul Rossington	**Plot ID:**	MHR01	**Date:**	30/01/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Other (OG)	*Amyema pendula*	0.3	5	no	N
Shrub (SG)	*Acacia ulicifolia (Prickly Moses)*	0.1	3	no	N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.2	4	no	N
Shrub (SG)	*Podolobium ilicifolium (Prickly Shaggy Pea)*	0.3	6	no	N
Shrub (SG)	*Acacia terminalis (Sunshine Wattle)*	0.1	3	no	N

BAM Site – Field Survey Form

Plot ID:	MHR02	**Date:**	30/01/2025	**Project number:**	E221111	**Plot dimensions:**	50x5
Datum:	GDA94	**Easting:**	231,544	**Recorders:**	Callan Douchkov,Paul Rossington		
Zone:	56	**Northing:**	6,288,909	**IBRA region:**	Bathurst	**Midline bearing:**	60
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DNG	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	5
	Grasses etc.:	9
	Forbs:	10
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	1.6
	Shrubs:	1.3
	Grasses etc.:	68.2
	Forbs:	1.1
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.8

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	2	1	1	1	1
Average litter cover (%):	1.2				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Soil colour:		**Landform element:**	Crest
Soil texture:		**Landform pattern:**	Hills

Roadside easement upon sandstone ledge

Plot Disturbance

Previously cleared/ disturbed for road construction. Blackberry patches throughout.
Note: plot extrapolates data to full plot size due to limited area and fence.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Callan Douchkov,Paul Rossington	**Plot ID:**	MHR02	**Date:**	30/01/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Themeda triandra*	50	2000	no	N
	Paspalum dilatatum (Paspalum)	0.2	20	no	HTE
	Hypericum perforatum (St. Johns Wort)	0.3	100	no	HTE
	Phalaris aquatica (Phalaris)	0.4	200	no	E
	Conyza spp. (A Fleabane)	0.1	1	no	E
Tree (TG)	*Acacia melanoxylon (Blackwood)*	1	10	no	N
	Plantago lanceolata (Lamb's Tongues)	0.2	50	no	E
	Hypochaeris radicata (Catsear)	0.1	80	no	E
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	15	1000	no	N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	2	no	N
Forb (FG)	*Thelymitra spp.*	0.1	2	no	N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	20	no	N
Forb (FG)	*Leptorhynchos squamatus (Scaly Buttons)*	0.2	70	no	N
Grass & grasslike (GG)	*Schoenus spp.*	0.1	50	no	N
Forb (FG)	*Haloragis heterophylla (Variable Raspwort)*	0.1	8	no	N
Forb (FG)	*Lythrum hyssopifolia (Hyssop Loosestrife)*	0.1	2	no	N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	0.5	3	no	N
Forb (FG)	*Oxalis perennans*	0.1	20		N
	Dactylis glomerata (Cocksfoot)	0.2	20	no	E
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	0.1	1	no	N
Grass & grasslike (GG)	*Dichelachne spp. (A Plumegrass)*	0.5	200	no	N
Shrub (SG)	*Cassinia sifton*	0.1	4	no	N
Tree (TG)	*Eucalyptus sieberi (Silvertop Ash)*	0.1	1	no	N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.3	6	no	HTE
Shrub (SG)	*Leptospermum continentale (Prickly Teatree)*	0.8	10	no	N
Forb (FG)	*Solenogyne bellioides (Solengyne)*	0.1	6	no	N
Shrub (SG)	*Astroloma humifusum (Native Cranberry)*	0.1	1	no	N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.2	50	no	N
	Betula spp.	0.1	1	no	E
Forb (FG)	*Euchiton spp. (A Cudweed)*	0.1	2	no	N
	Phalaris aquatica (Phalaris)	0.1	15	no	E
	Cirsium vulgare (Spear Thistle)	0.1	2	no	E
	Crataegus spp.	0.2	1	no	E
	Dactylis glomerata (Cocksfoot)	0.2	10	no	E
	Anthoxanthum odoratum (Sweet Vernal Grass)	2	400	no	E
Grass & grasslike (GG)	*Hemarthria uncinata (Matgrass)*	0.1	2	no	N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.2	2	no	N
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	0.1	1	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	200	no	N
Grass & grasslike (GG)	*Rytidosperma spp.*	0.2	30	no	N
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	1	no	N

BAM Site – Field Survey Form

Plot ID:	MHR03	**Date:**	31/01/2025	**Project number:**	E221111	**Plot dimensions:**	50x10
Datum:	GDA94	**Easting:**	231,470	**Recorders:**	Callan Douchkov,Paul Rossington		
Zone:	56	**Northing:**	6,288,860	**IBRA region:**	Bathurst	**Midline bearing:**	230
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	Moderate	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	6
	Grasses etc.:	11
	Forbs:	12
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	32
	Shrubs:	7.5
	Grasses etc.:	6.1
	Forbs:	1.2
	Ferns:	0.3
	Other:	2
High Threat Weed cover:		7.9

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	5
80 + cm:	1		
50 – 79 cm:	0		
30 – 49 cm:	4		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	15	55	10	5	3
Average litter cover (%):	17.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Soil colour:	Rounded rivers stone in cutting face. Old alluvium	**Landform element:**	Mid slope
Soil texture:		**Landform pattern:**	Hills

Roadside vegetation adjacent magpie Hollow Road. Sandstone ledges

Plot Disturbance

Blackberry infestation, Roadside disturbance.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Callan Douchkov,Paul Rossington	**Plot ID:**	MHR03	**Date:**	31/01/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	20	10	no	N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	10	30	no	N
Shrub (SG)	*Acacia obtusifolia*	3	15	no	N
Other (OG)	*Yucca spp.*	1	5	no	N
Shrub (SG)	*Leucopogon lanceolatus*	0.3	4	no	N
	Rubus fruticosus sp. agg. (Blackberry complex)	7	20	no	HTE
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.8	15	no	N
Shrub (SG)	*Ozothamnus diosmifolius (White Dogwood)*	0.2	4	no	N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	3	50	no	N
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	0.1	2	no	N
	Anthoxanthum odoratum (Sweet Vernal Grass)	10	2000	no	E
	Dactylis glomerata (Cocksfoot)	15	2000	no	E
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	20	no	E
	Plantago lanceolata (Lamb's Tongues)	0.2	100	no	E
	Cirsium vulgare (Spear Thistle)	0.1	2	no	E
	Hypericum perforatum (St. Johns Wort)	0.7	200	no	HTE
Forb (FG)	*Senecio hispidulus (Hill Fireweed)*	0.1	3	no	N
	Hypochaeris radicata (Catsear)	0.2	300	no	E
Forb (FG)	*Senecio quadridentatus (Cotton Fireweed)*	0.1	1	no	N
Shrub (SG)	*Leptospermum continentale (Prickly Teatree)*	0.2	5	no	N
Other (OG)	*Amyema pendula*	1	9	no	N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	5	no	N
Fern (EG)	*Pteridium esculentum (Bracken)*	0.3	10	no	N
	Prunus spp.	1	1	no	E
	Ligustrum sinense (Small-leaved Privet)	0.1	2	no	HTE
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	4	no	N
Forb (FG)	*Oxalis perennans*	0.1	1	no	N
	Crataegus spp.	0.3	4	no	E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	300	no	N
Forb (FG)	*Sonchus spp. (Sowthistle)*	0.1	20	no	N
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	0.1	1	no	N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	3	4	no	N
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	2	3	no	N
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.1	1	no	N
Forb (FG)	*Stypandra glauca (Nodding Blue Lily)*	0.1	2	no	N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	3	no	N
Grass & grasslike (GG)	*Hemarthria uncinata (Matgrass)*	0.1	1	no	N
Grass & grasslike (GG)	*Carex spp.*	0.1	20	no	N
Grass & grasslike (GG)	*Digitaria spp. (A Finger Grass)*	0.1	4	no	N
Forb (FG)	*Acaena ovina (Acaena)*	0.1	3	no	N
Forb (FG)	*Epilobium spp.*	0.1	8	no	N
Grass & grasslike (GG)	*Setaria spp.*	0.1	20	no	N
Grass & grasslike (GG)	*Themeda triandra*	0.2	50	no	N

Project name:	E221111				
Recorders:	Callan Douchkov,Paul Rossington	Plot ID:	MHR03	Date:	31/01/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Poa spp.*	0.1	4	no	N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	5	no	N
	Briza maxima (Quaking Grass)	0.1	20	no	E
	Paspalum dilatatum (Paspalum)	0.1	2	no	HTE
Grass & grasslike (GG)	*Rytidosperma spp.*	0.2	40	no	N

BAM Site – Field Survey Form

Plot ID:	MHR04	**Date:**	26/02/2025	**Project number:**	E221111	**Plot dimensions:**	50x10m, 40x10m
Datum:	GDA94	**Easting:**	231,040	**Recorders:**	Paul Rossington,Callan Douchkov		
Zone:	56	**Northing:**	6,288,155	**IBRA region:**	Bathurst	**Midline bearing:**	20
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	Moderate	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	5
	Grasses etc.:	11
	Forbs:	2
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	14
	Shrubs:	25.5
	Grasses etc.:	73.5
	Forbs:	0.2
	Ferns:	0.1
	Other:	0
High Threat Weed cover:		0.8

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	6
80 + cm:	2		
50 – 79 cm:	0		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	2
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	9	15	80	80
Average litter cover (%):	37.8				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Soil colour:	Yellow brown	**Landform element:**	Mid slope
Soil texture:	Sandy loam	**Landform pattern:**	Hills

Granite

Plot Disturbance

Partial clearing. Weed invasion

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Callan Douchkov	**Plot ID:**	MHR04	**Date:**	26/02/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	12	20		N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	1	2	no	N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	25	40	no	N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	1	2		N
Shrub (SG)	*Cassinia spp.*	0.1	2	no	N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	10	1000	no	N
Grass & grasslike (GG)	*Rytidosperma spp.*	25	2500	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	30	2000	no	N
	Hypericum perforatum (St. Johns Wort)	0.3	80	no	HTE
	Dactylis glomerata (Cocksfoot)	1	200	no	E
Grass & grasslike (GG)	*Panicum effusum (Hairy Panic)*	0.1	8	no	N
	Plantago lanceolata (Lamb's Tongues)	0.1	3	no	E
	Anthoxanthum odoratum (Sweet Vernal Grass)	1	500	no	E
	Conyza spp. (A Fleabane)	0.1	1	no	E
Grass & grasslike (GG)	*Lomandra confertifolia (Matrush)*	0.2	20	no	N
Fern (EG)	*Pteridium esculentum (Bracken)*	0.1	1	no	N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	0.2	20		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	0.3	20		N
	Hypochaeris radicata (Catsear)	0.1	20	no	E
Forb (FG)	*Oxalis perennans*	0.1	3	no	N
Grass & grasslike (GG)	*Digitaria parviflora (Small-flowered Finger Grass)*	7	300	no	N
	Setaria parviflora	0.1	50	no	E
	Paspalum dilatatum (Paspalum)	0.2	15	no	HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	0.2	5	no	HTE
	Oxalis latifolia	0.1	5		E
Shrub (SG)	*Ozothamnus diosmifolius (White Dogwood)*	0.1	1	no	N
Shrub (SG)	*Daviesia corymbosa*	0.2	3	no	N
	Acetosella vulgaris (Sheep Sorrel)	0.1	20	no	HTE
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	0.1	1	no	N
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	0.5	20	no	N
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	1		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	12	no	N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.1	8	no	N

BAM Site – Field Survey Form

Plot ID:	Mhr05	**Date:**	26/02/2025	**Project number:**	E221111	**Plot dimensions:**	50x10
Datum:	GDA94	**Easting:**	230,935	**Recorders:**	Callan Douchkov,Paul Rossington		
Zone:	56	**Northing:**	6,287,897	**IBRA region:**	Bathurst	**Midline bearing:**	30
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DEGH	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	8
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0.2
	Shrubs:	0
	Grasses etc.:	10.2
	Forbs:	0.3
	Ferns:	0
	Other:	0
High Threat Weed cover:		31

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	1	2	3	2	0
Average litter cover (%):	1.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:	Light brown	**Landform element:**	Mid slope
Soil texture:	Sandy loam	**Landform pattern:**	Hills

Plot Disturbance
High weed invasion, roadside verge

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Callan Douchkov,Paul Rossington	**Plot ID:**	Mhr05	**Date:**	26/02/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Dactylis glomerata (Cocksfoot)	15	800	no	E
	Paspalum dilatatum (Paspalum)	15	800	no	HTE
	Plantago lanceolata (Lamb's Tongues)	2	500	no	E
	Anthoxanthum odoratum (Sweet Vernal Grass)	10	300	no	E
	Medicago lupulina (Black Medic)	0.2	80	no	E
	Trifolium repens (White Clover)	3	150	no	E
	Hypochaeris radicata (Catsear)	0.3	100	no	E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	3	300	no	N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	5	2000	no	N
	Oenothera stricta subsp. stricta	0.1	2	no	E
	Crataegus monogyna (Hawthorn)	1	2	no	HTE
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	0.1	2	no	N
	Hypericum perforatum (St. Johns Wort)	7	500	no	HTE
Tree (TG)	*Acacia melanoxylon (Blackwood)*	0.2	2	no	N
	Eragrostis curvula (African Lovegrass)	6	100	no	HTE
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	0.2	20	no	N
Grass & grasslike (GG)	*Panicum effusum (Hairy Panic)*	0.1	2	no	N
Grass & grasslike (GG)	*Setaria spp.*	0.7	80	no	N
Forb (FG)	*Acaena spp. (Sheep's Burr)*	0.1	2	no	N
Forb (FG)	*Oxalis perennans*	0.1	3	no	N
	Echium plantagineum (Patterson's Curse)	0.1	2	no	E
Forb (FG)	*Epilobium hirtigerum*	0.1	1	no	N
	Conyza spp. (A Fleabane)	0.1	8	no	E
	Nassella trichotoma (Serrated Tussock)	1	1	no	HTE
	Scabiosa spp.	0.2	10	no	E
	Cenchrus clandestinus (Kikuyu Grass)	1	10	no	HTE
	Phalaris aquatica (Phalaris)	0.1	50	no	E
Grass & grasslike (GG)	*Dichelachne spp. (A Plumegrass)*	0.1	2	no	N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	1	2	no	N

BAM Site – Field Survey Form

Plot ID:	MHR06	**Date:**	11/03/2025	**Project number:**	E221111	**Plot dimensions:**	10x100
Datum:	GDA94	**Easting:**	230,475	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,287,396	**IBRA region:**	Bathurst	**Midline bearing:**	206
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DEGH	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	1
	Grasses etc.:	6
	Forbs:	2
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.9
	Grasses etc.:	14.4
	Forbs:	0.3
	Ferns:	2
	Other:	0
High Threat Weed cover:		61.7

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	15	10	20	10	15
Average litter cover (%):	14				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Ridge
Soil texture:		**Landform pattern:**	Hills

Plot Disturbance
Roadside. Litter. Weedy.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	MHR06	**Date:**	03/11/25

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Paspalum dilatatum (Paspalum)	15	1800		HTE
	Phalaris aquatica (Phalaris)	6	800		E
	Dactylis glomerata (Cocksfoot)	20	2000		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	8	400		N
	Setaria parviflora	0.3	100		E
	Hypochaeris radicata (Catsear)	0.7	100		E
	Eragrostis curvula (African Lovegrass)	45	3000		HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	0.8	3		HTE
	Echium plantagineum (Patterson's Curse)	0.2	8		E
	Hypericum perforatum (St. Johns Wort)	0.7	100		HTE
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	5	400		N
	Acetosella vulgaris (Sheep Sorrel)	0.1	20		HTE
Forb (FG)	*Oxalis perennans*	0.1	5		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.2	15		N
Grass & grasslike (GG)	*Panicum decompositum (Native Millet)*	0.1	4		N
Grass & grasslike (GG)	*Digitaria breviglumis*	0.2	20		N
	Medicago spp. (A Medic)	0.1	7		E
	Cyperus eragrostis (Umbrella Sedge)	0.1	4		HTE
	Plantago lanceolata (Lamb's Tongues)	0.3	100		E
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.8	200		N
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
Fern (EG)	*Pteridium esculentum (Bracken)*	2	20		N
Shrub (SG)	*Rubus parvifolius (Native Raspberry)*	0.9	8		N
	Taraxacum officinale (Dandelion)	0.1	5		E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	2		E
Grass & grasslike (GG)	*Themeda triandra*	0.3	20		N

BAM Site – Field Survey Form

Plot ID:	MHR07	**Date:**	11/03/2025	**Project number:**	E221111	**Plot dimensions:**	10x100
Datum:	GDA94	**Easting:**	232,363	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,289,084	**IBRA region:**	Bathurst	**Midline bearing:**	88
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DNG	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	11
	Forbs:	2
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	84.8
	Forbs:	0.2
	Ferns:	0
	Other:	0
High Threat Weed cover:		13.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	20	10	10	5
Average litter cover (%):	10				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Flat
Soil texture:		**Landform pattern:**	Hills

Land sloping to the west

Plot Disturbance

Roadside plot. Weedy. Litter.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	MHR07	**Date:**	03/11/25

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Themeda triandra*	45	2000		N
	Paspalum dilatatum (Paspalum)	10	500		HTE
	Hypochaeris radicata (Catsear)	2	150		E
	Plantago lanceolata (Lamb's Tongues)	0.6	100		E
	Hypericum perforatum (St. Johns Wort)	0.1	30		HTE
Forb (FG)	*Oxalis perennans*	0.1	7		N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	25	400		N
	Setaria parviflora	0.1	10		E
Grass & grasslike (GG)	*Panicum decompositum (Native Millet)*	0.2	20		N
	Plantago lanceolata (Lamb's Tongues)	0.3	100		E
	Centaurium spp.	0.1	200		E
	Agrostis capillaris (Browntop Bent)	1	70		HTE
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.4	30		E
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	3	50		N
Grass & grasslike (GG)	*Festuca spp.*	0.3	40		N
	Conyza spp. (A Fleabane)	0.1	5		E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	10	1000		N
Grass & grasslike (GG)	*Digitaria breviglumis*	0.3	20		N
	Cyperus eragrostis (Umbrella Sedge)	0.2	8		HTE
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.4	50		N
	Eragrostis curvula (African Lovegrass)	2	500		HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	1		HTE
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.4	15		N
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	0.1	4		N
	Dactylis glomerata (Cocksfoot)	0.1	2		E
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	1		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	MHR08	**Date:**	14/03/2025	**Project number:**	E221111	**Plot dimensions:**	5x100
Datum:	GDA94	**Easting:**	231,850	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,288,930	**IBRA region:**	Bathurst	**Midline bearing:**	273
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	Poor	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	2
	Grasses etc.:	5
	Forbs:	0
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.4
	Grasses etc.:	4.3
	Forbs:	0
	Ferns:	5
	Other:	0
High Threat Weed cover:		56.7

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	3
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	15	20	15	10	30
Average litter cover (%):	18				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Soil colour:		**Landform element:**	
Soil texture:	Clay loam	**Landform pattern:**	Hills

Plot adjacent to road. Sloped to the E.

Plot Disturbance

Weedy road edge. Litter. Eroded channel on the edge of plot.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	MHR08	**Date:**	14/03/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Phalaris aquatica (Phalaris)	20	2000		E
	Festuca elatior (Tall Fescue)	10	1000		E
Fern (EG)	*Pteridium esculentum (Bracken)*	5	40		N
	Dactylis glomerata (Cocksfoot)	15	2000		E
	Hypericum perforatum (St. Johns Wort)	4	600		HTE
	Foeniculum vulgare (Fennel)	0.1	1		E
	Eragrostis curvula (African Lovegrass)	45	4000		HTE
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	300		N
	Sixalix atropurpurea (Pincushion)	1	300		E
Shrub (SG)	*Persoonia lanceolata (Lance Leaf Geebung)*	0.3	100		N
	Arrhenatherum elatius (Oatgrass)	0.1	3		E
	Paspalum dilatatum (Paspalum)	1	100		HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	0.7	10		HTE
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	2	12		N
	Sanguisorba minor subsp. muricata (Sheep's Burnet)	0.1	1		E
Shrub (SG)	*Cassinia quinquefaria*	0.1	1		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	0.1	1		N
	Cenchrus clandestinus (Kikuyu Grass)	6	10		HTE
	Taraxacum officinale (Dandelion)	0.1	3		E
	Hypochaeris radicata (Catsear)	0.1	10		E
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	7		N
	Sporobolus africanus (Parramatta Grass)	0.1	3		E
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	0.1	1		N
	Setaria pumila (Pale Pigeon Grass)	0.1	1		E
	Medicago lupulina (Black Medic)	0.1	3		E
	Oenothera stricta subsp. stricta	0.1	1		E
	Verbena officinalis (Common Verbena)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	MHR09	**Date:**	11/03/2025	**Project number:**	E221111	**Plot dimensions:**	10x100
Datum:	GDA94	**Easting:**	230,214	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,287,217	**IBRA region:**	Bathurst	**Midline bearing:**	63
Plant Community Type:		3348: Southern Tableland Granites Ribbon Gum Grassy Forest		**Condition class:**	DEGH	**PCT % cleared:**	82.10%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Tableland Clay Grassy Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	1
	Grasses etc.:	12
	Forbs:	2
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	4.7
	Shrubs:	0.1
	Grasses etc.:	12.9
	Forbs:	0.3
	Ferns:	0.8
	Other:	0
High Threat Weed cover:		24.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	20	30	10	30	15
Average litter cover (%):	21				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Soil colour:		**Landform element:**	Ridge
Soil texture:		**Landform pattern:**	Hills

Road side plot. Granite substrate.

Plot Disturbance

Road side. Some litter, weedy.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	MHR09	**Date:**	03/11/25

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Acacia melanoxylon (Blackwood)*	0.7	4		N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	4	40		N
Fern (EG)	*Pteridium esculentum (Bracken)*	0.8	20		N
	Eragrostis curvula (African Lovegrass)	20	3000		HTE
	Verbena bonariensis (Purpletop)	3	50		E
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.1	1		N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	3	500		N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	1	50		N
	Sanguisorba minor subsp. muricata (Sheep's Burnet)	0.7	100		E
	Rumex crispus (Curled Dock)	0.1	3		E
	Phalaris aquatica (Phalaris)	7	1000		E
	Setaria parviflora	0.1	30		E
Grass & grasslike (GG)	*Themeda triandra*	4	300		N
	Echium plantagineum (Patterson's Curse)	0.8	20		E
	Hypericum perforatum (St. Johns Wort)	0.7	60		HTE
	Centaurea spp. (Thistle)	0.1	40		E
Grass & grasslike (GG)	*Digitaria breviglumis*	1	200		N
	Hypochaeris radicata (Catsear)	0.1	40		E
Grass & grasslike (GG)	*Panicum decompositum (Native Millet)*	0.1	1		N
	Paspalum dilatatum (Paspalum)	3	200		HTE
	Cyperus eragrostis (Umbrella Sedge)	0.2	10		HTE
	Acetosa sagittata (Rambling Dock)	0.1	70		HTE
	Dactylis glomerata (Cocksfoot)	5	400		E
Forb (FG)	*Oxalis spp.*	0.1	2		N
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	0.1	5		N
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.1	2		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	3	600		N
	Hirschfeldia incana (Buchan Weed)	0.1	1		E
Forb (FG)	*Acaena echinata (Sheep's Burr)*	0.2	8		N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	2		HTE
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	0.2	10		N
Grass & grasslike (GG)	*Sporobolus spp. (Rat's Tail Couch)*	0.1	5		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	1		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	0.2	80		N
	Scabiosa spp.	0.1	5		E
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
	Tragopogon porrifolius subsp. porrifolius (Salsify)	0.1	2		E
	Oenothera stricta subsp. stricta	0.1	6		E

BAM Site – Field Survey Form

Plot ID:	PE01	**Date:**	13/03/2025	**Project number:**	E221111	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	235,921	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,290,769	**IBRA region:**	Burragorang	**Midline bearing:**	137
Plant Community Type:		3385: Southern Tableland Creekflat Swamp Woodland		**Condition class:**	Poor	**PCT % cleared:**	75.20%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Subalpine Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	1
	Grasses etc.:	8
	Forbs:	8
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	8
	Shrubs:	0.1
	Grasses etc.:	24.5
	Forbs:	0.8
	Ferns:	0.2
	Other:	0
High Threat Weed cover:		30.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	20
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	10	15	10	15	20
Average litter cover (%):	14				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Open depression
Soil texture:	Medium heavy clay	**Landform pattern:**	Plains

Cleared landscape depression.

Plot Disturbance

Cleared, grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	PE01	**Date:**	13/03/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Acacia dealbata (Silver Wattle)*	6	5		N
Tree (TG)	*Eucalyptus stellulata (Black Sally)*	2	1		N
Shrub (SG)	*Ozothamnus diosmifolius (White Dogwood)*	0.1	2		N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	0.1	1		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	2	200		N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	2		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.2	80		E
	Hypochaeris radicata (Catsear)	30	2000		E
	Plantago lanceolata (Lamb's Tongues)	0.1	50		E
	Cirsium vulgare (Spear Thistle)	0.1	20		E
	Rubus fruticosus sp. agg. (Blackberry complex)	0.2	5		HTE
	Hirschfeldia incana (Buchan Weed)	0.1	3		E
Fern (EG)	*Pteridium esculentum (Bracken)*	0.2	5		N
	Agrostis capillaris (Browntop Bent)	30	2000		HTE
	Crepis capillaris (Smooth Hawksbeard)	0.1	10		E
Forb (FG)	*Oxalis perennans*	0.1	50		N
Grass & grasslike (GG)	*Rytidosperma pilosum (Smooth-flowered Wallaby Grass)*	0.1	1		N
	Conyza sumatrensis (Tall fleabane)	0.1	2		E
	Solanum chenopodioides (Whitetip Nightshade)	0.1	6		E
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	20	1000		N
	Modiola caroliniana (Red-flowered Mallow)	0.1	1		E
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	0.1	5		N
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	2	300		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	2		N
	Acetosella vulgaris (Sheep Sorrel)	0.2	100		HTE
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	20		N
Grass & grasslike (GG)	*Juncus australis (Rush)*	0.1	3		N
Forb (FG)	*Epilobium hirtigerum*	0.1	1		N
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.1	1		N
Forb (FG)	*Acaena echinata (Sheep's Burr)*	0.1	2		N
	Trifolium repens (White Clover)	0.1	20		E
Forb (FG)	*Einadia trigonos (Fishweed)*	0.1	3		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	PE02	**Date:**	13/03/2025	**Project number:**	E221111	**Plot dimensions:**	20x20
Datum:	GDA94	**Easting:**	235,967	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,290,655	**IBRA region:**	Burragorang	**Midline bearing:**	327
Plant Community Type:		3385: Southern Tableland Creekflat Swamp Woodland		**Condition class:**	DNG	**PCT % cleared:**	75.20%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Subalpine Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	0
	Grasses etc.:	6
	Forbs:	6
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0.2
	Shrubs:	0
	Grasses etc.:	79.4
	Forbs:	5.5
	Ferns:	0
	Other:	0
High Threat Weed cover:		4.1

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	1
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	5	15	15	20	10
Average litter cover (%):	13				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Open depression
Soil texture:	Medium heavy clay	**Landform pattern:**	Hills

Cleared depression.

Plot Disturbance
Cleared, grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	PE02	**Date:**	13/03/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	75	3000		N
Grass & grasslike (GG)	*Austrostipa nodosa (A Speargrass)*	4	200		N
	Hypochaeris radicata (Catsear)	0.2	100		E
Forb (FG)	*Coronidium monticola*	5	50		N
	Hypericum perforatum (St. Johns Wort)	0.1	8		HTE
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	4		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	1		E
Grass & grasslike (GG)	*Rytidosperma pilosum (Smooth-flowered Wallaby Grass)*	0.1	3		N
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	20		N
	Crepis capillaris (Smooth Hawksbeard)	0.1	5		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	3	200		E
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	1		E
	Rubus fruticosus sp. agg. (Blackberry complex)	4	6		HTE
Tree (TG)	*Acacia dealbata (Silver Wattle)*	0.1	1		N
	Echium plantagineum (Patterson's Curse)	0.1	4		E
	Plantago lanceolata (Lamb's Tongues)	0.1	40		E
Forb (FG)	*Solenogyne gunnii (Solengyne)*	0.1	3		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	2		N
Grass & grasslike (GG)	*Digitaria diffusa (Open Summer-grass)*	0.1	20		N
Forb (FG)	*Acaena spp. (Sheep's Burr)*	0.1	1		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	1		N
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	0.1	2		N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	PE03	**Date:**	13/03/2025	**Project number:**	E221111	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	235,868	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,290,795	**IBRA region:**	Burragorang	**Midline bearing:**	347
Plant Community Type:		3385: Southern Tableland Creekflat Swamp Woodland		**Condition class:**	DEGH	**PCT % cleared:**	75.20%
Vegetation Formation:		Grassy Woodlands		**Veg. Class:**	Subalpine Woodlands		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	10
	Forbs:	8
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	3.7
	Forbs:	1
	Ferns:	0
	Other:	0
High Threat Weed cover:		55.1

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	5	5	10	5	5
Average litter cover (%):	6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Open depression
Soil texture:	Medium heavy clay	**Landform pattern:**	Hills

Plot Disturbance
Cleared, grazed

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	PE03	**Date:**	13/03/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Paronychia brasiliana (Chilean Whitlow Wort, Brazilian Whitlow)	0.4	3000		E
	Acetosella vulgaris (Sheep Sorrel)	30	8000		HTE
	Crepis capillaris (Smooth Hawksbeard)	0.3	500		E
	Verbena bonariensis (Purpletop)	0.1	6		E
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	0.2	20		N
	Trifolium repens (White Clover)	20	2000		E
	Conyza bonariensis (Flaxleaf Fleabane)	0.7	40		E
	Echium plantagineum (Patterson's Curse)	0.1	8		E
	Hypochaeris radicata (Catsear)	1	800		E
Forb (FG)	*Oxalis perennans*	0.2	300		N
	Gamochaeta spp.	0.1	40		E
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.2	30		N
Grass & grasslike (GG)	*Juncus australis (Rush)*	0.8	30		N
Forb (FG)	*Coronidium monticola*	0.1	1		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	300		N
	Cirsium vulgare (Spear Thistle)	0.1	10		E
Grass & grasslike (GG)	*Rytidosperma pilosum (Smooth-flowered Wallaby Grass)*	0.1	30		N
Forb (FG)	*Solenogyne gunnii (Solengyne)*	0.1	8		N
	Eleusine tristachya (Goose Grass)	0.1	3		E
	Lotus angustissimus (Slender Birds-foot Trefoil)	0.1	1		E
	Agrostis capillaris (Browntop Bent)	25	5000		HTE
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	30		N
	Polygonum aviculare (Wireweed)	0.1	8		E
	Lolium perenne (Perennial Ryegrass)	0.1	8		E
	Setaria pumila (Pale Pigeon Grass)	0.1	2		E
	Arrhenatherum elatius (Oatgrass)	0.2	50		E
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.1	1		N
	Cyperus eragrostis (Umbrella Sedge)	0.1	1		HTE
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	0.1	1		N
Forb (FG)	*Lepidium pseudotasmanicum*	0.1	1		N
	Bromus catharticus (Praire Grass)	0.1	1		E
Forb (FG)	*Epilobium hirtigerum*	0.1	1		N
	Modiola caroliniana (Red-flowered Mallow)	0.1	1		E
Grass & grasslike (GG)	*Eragrostis benthamii*	0.1	3		N
Grass & grasslike (GG)	*Digitaria diffusa (Open Summer-grass)*	0.1	2		N
Grass & grasslike (GG)	*Panicum effusum (Hairy Panic)*	0.1	1		N
Forb (FG)	*Wahlenbergia multicaulis (Tadgell's Bluebell)*	0.1	1		N
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	PE04	**Date:**	13/03/2025	**Project number:**	E221111	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	235,760	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,291,129	**IBRA region:**	Burragorang	**Midline bearing:**	158
Plant Community Type:		3687: Newnes Plateau Peppermint-Ash Tall Forest		**Condition class:**	DEGH	**PCT % cleared:**	3.11%
Vegetation Formation:		Dry Sclerophyll Forests (Shrubby sub-formation)		**Veg. Class:**	Sydney Montane Dry Sclerophyll Forests		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	1
	Grasses etc.:	8
	Forbs:	6
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0.1
	Grasses etc.:	41.2
	Forbs:	10.6
	Ferns:	0
	Other:	0
High Threat Weed cover:		1.1

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	2	3	5	10	5
Average litter cover (%):	5				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Soil colour:		**Landform element:**	Flat
Soil texture:	Gravelly	**Landform pattern:**	Hills

Plot located on fill.

Plot Disturbance

Filled and capped. Grazed.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	PE04	**Date:**	13/03/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Chloris truncata (Windmill Grass)*	0.4	200		N
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.2	100		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	2	300		E
	Centaurium erythraea (Common Centaury)	0.2	100		E
	Plantago lanceolata (Lamb's Tongues)	5	1000		E
	Hypochaeris radicata (Catsear)	15	4000		E
Forb (FG)	*Wahlenbergia multicaulis (Tadgell's Bluebell)*	0.2	400		N
	Aster subulatus (Wild Aster)	0.1	2		E
Grass & grasslike (GG)	*Bothriochloa macra (Red Grass)*	40	4000		N
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	10	2000		N
Forb (FG)	*Solenogyne gunnii (Solengyne)*	0.1	3		N
Grass & grasslike (GG)	*Juncus australis (Rush)*	0.1	1		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	1		N
	Gamochaeta spp.	0.1	1		E
Grass & grasslike (GG)	*Austrostipa rudis*	0.1	1		N
Grass & grasslike (GG)	*Panicum effusum (Hairy Panic)*	0.2	40		N
	Conyza spp. (A Fleabane)	0.1	3		E
	Verbena bonariensis (Purpletop)	0.1	4		E
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	1		E
Forb (FG)	*Oxalis perennans*	0.1	8		N
	Setaria parviflora	0.3	3		E
	Prunella vulgaris (Self-heal)	0.1	1		E
	Trifolium repens (White Clover)	0.1	2		E
	Genista monspessulana (Montpellier Broom)	0.1	2		HTE
Shrub (SG)	*Cassinia sifton*	0.1	2		N
Grass & grasslike (GG)	*Rytidosperma pilosum (Smooth-flowered Wallaby Grass)*	0.1	1		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	1		N
	Cenchrus clandestinus (Kikuyu Grass)	0.4	20		HTE
	Axonopus fissifolius (Narrow-leafed Carpet Grass)	0.1	1		HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	1		HTE
	Paspalum dilatatum (Paspalum)	0.3	50		HTE
	Hypericum perforatum (St. Johns Wort)	0.1	2		HTE
Grass & grasslike (GG)	*Eragrostis trachycarpa (A Lovegrass)*	0.1	10		N

BAM Site – Field Survey Form

Plot ID:	PE05	**Date:**	14/03/2025	**Project number:**	E221111	**Plot dimensions:**	20x50
Datum:	GDA94	**Easting:**	235,749	**Recorders:**	Paul Rossington,Ross Davey		
Zone:	56	**Northing:**	6,291,037	**IBRA region:**	Burragorang	**Midline bearing:**	343
Plant Community Type:		3687: Newnes Plateau Peppermint-Ash Tall Forest		**Condition class:**	DEGH	**PCT % cleared:**	3.11%
Vegetation Formation:		Dry Sclerophyll Forests (Shrubby sub-formation)		**Veg. Class:**	Sydney Montane Dry Sclerophyll Forests		

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	0
	Grasses etc.:	5
	Forbs:	7
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	0
	Grasses etc.:	40.4
	Forbs:	1.5
	Ferns:	0
	Other:	0
High Threat Weed cover:		27.5

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	10	10	15	5	10
Average litter cover (%):	10				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features			
Soil colour:		**Landform element:**	Flat
Soil texture:	Medium heavy clay	**Landform pattern:**	Hills

Land draining to the NW

Plot Disturbance

Filled and capped. Grazed.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul Rossington,Ross Davey	**Plot ID:**	PE05	**Date:**	14/03/2025

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Trifolium repens (White Clover)	0.7	50		E
	Paspalum dilatatum (Paspalum)	25	2000		HTE
	Plantago lanceolata (Lamb's Tongues)	8	2000		E
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.2	20		N
Grass & grasslike (GG)	*Cynodon dactylon (Common Couch)*	40	500		N
	Hypochaeris radicata (Catsear)	0.2	100		E
	Taraxacum officinale (Dandelion)	0.1	2		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	3	500		E
	Cytisus scoparius subsp. scoparius (English Broom)	0.1	3		HTE
	Gamochaeta spp.	0.1	40		E
Forb (FG)	*Oxalis perennans*	0.1	40		N
Forb (FG)	*Persicaria prostrata (Creeping Knotweed)*	0.8	2		N
	Verbena bonariensis (Purpletop)	0.1	3		E
	Conyza spp. (A Fleabane)	0.1	5		E
	Hypericum perforatum (St. Johns Wort)	0.1	1		HTE
	Eleusine tristachya (Goose Grass)	0.1	8		E
	Setaria parviflora	0.1	5		E
Forb (FG)	*Solenogyne gunnii (Solengyne)*	0.1	1		N
	Rumex crispus (Curled Dock)	0.1	3		E
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	20		N
	Modiola caroliniana (Red-flowered Mallow)	0.1	1		E
	Echium plantagineum (Patterson's Curse)	0.1	2		E
	Cirsium vulgare (Spear Thistle)	0.1	3		E
	Eragrostis curvula (African Lovegrass)	0.1	1		HTE
	Centaurium erythraea (Common Centaury)	0.1	50		E
	Cenchrus clandestinus (Kikuyu Grass)	2	10		HTE
	Acetosella vulgaris (Sheep Sorrel)	0.1	20		HTE
Grass & grasslike (GG)	*Juncus australis (Rush)*	0.1	1		N
	Genista monspessulana (Montpellier Broom)	0.1	2		HTE
	Arrhenatherum elatius (Oatgrass)	0.1	5		E
Forb (FG)	*Lepidium pseudotasmanicum*	0.1	1		N
	Foeniculum vulgare (Fennel)	0.1	1		E
Grass & grasslike (GG)	*Rytidosperma pilosum (Smooth-flowered Wallaby Grass)*	0.1	3		N
Forb (FG)	*Euchiton sphaericus (Star Cudweed)*	0.1	8		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	1		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.1	1		N
	Artemisia spp.	0.1	5		E

BAM Site – Field Survey Form

Plot ID:	LL01	**Date:**	02/11/23	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	228,895	**Recorders:**	AC, RD			
Zone:	56	**Northing:**	6,289,996	**IBRA region:**	Hill End		**Midline bearing:**	280
Plant Community Type:		3369: Central Tableland Ranges Peppermint-Gum Grassy Forest			**Condition class:**	Moderate	**PCT confidence:**	
Vegetation Class:		Southern Tableland Grassy Woodlands			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	5
	Shrubs:	7
	Grasses etc.:	9
	Forbs:	20
	Ferns:	2
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	50
	Shrubs:	3.3
	Grasses etc.:	36.2
	Forbs:	7.8
	Ferns:	4.8
	Other:	0
High Threat Weed cover:		0.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	68
80 + cm:	4		
50 – 79 cm:	0		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	9
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	70	20	95	80	70
Average litter cover (%):	67				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Creek running through centre of plot, draining to Lake Lyell. Plot forms a V shape with creek running to the south. Soil is dry loamy.

Plot Disturbance

Minor exotic influence.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	AC, RD	**Plot ID:**	LL01	**Date:**	02/11/23

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	40	5	no	N
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	3	5	no	N
Tree (TG)	*Eucalyptus bridgesiana (Apple Box)*	0.5	1	no	N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	6	5	no	N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.3	1	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.1	1	no	N
Shrub (SG)	*Rubus parvifolius (Native Raspberry)*	2	50	no	N
Forb (FG)	*Bulbine bulbosa (Bulbine Lily)*	0.1	10	no	N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	1	no	N
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.1	1	no	N
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	0.3	20	no	N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	10	no	N
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	35	400	no	N
Forb (FG)	*Geranium solanderi (Native Geranium)*	1	200	no	N
Fern (EG)	*Pteridium esculentum (Bracken)*	4	200	no	N
Forb (FG)	*Senecio linearifolius (Fireweed Groundsel)*	0.3	30	no	N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.5	200	no	N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	1	200	no	N
Forb (FG)	*Senecio diaschides*	0.1	2	no	N
Forb (FG)	*Oxalis perennans*	0.1	2	no	N
	Hypericum perforatum (St. Johns Wort)	0.2	50	no	HTE
	Holcus lanatus (Yorkshire Fog)	1	100	no	E
	Conyza spp. (A Fleabane)	0.1	10	no	E
	Verbena bonariensis (Purpletop)	0.1	10	no	E
	Crataegus monogyna (Hawthorn)	0.1	1	no	HTE
	Hypochaeris radicata (Catsear)	0.2	40	no	E
	Cirsium vulgare (Spear Thistle)	0.3	20		E
	Rubus anglocandicans (Blackberry)	0.5	30	no	E
	Anthoxanthum odoratum (Sweet Vernal Grass)	30	1000	no	E
	Prunella vulgaris (Self-heal)	0.2	20	no	E
	Sonchus asper (Prickly Sowthistle)	0.1	5	no	E
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.3	50	no	N
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	0.2	1	no	N
Shrub (SG)	*Acacia longifolia*	0.3	3	no	N
Fern (EG)	*Adiantum aethiopicum (Common Maidenhair)*	0.8	100	no	N
Shrub (SG)	*Leucopogon lanceolatus*	0.3	1	no	N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	3	100	no	N
Forb (FG)	*Senecio quadridentatus (Cotton Fireweed)*	0.1	3	no	N
Grass & grasslike (GG)	*Echinopogon ovatus (Forest Hedgehog Grass)*	0.2	10	no	N
Grass & grasslike (GG)	*Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)*	0.1	2	no	N
Forb (FG)	*Desmodium gunnii (Slender Tick-trefoil)*	0.1	5	no	N
Shrub (SG)	*Lomatia myricoides (River Lomatia)*	0.1	2	no	N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	0.3	2	no	N

Project name:	E221111				
Recorders:	AC, RD	Plot ID:	LL01	Date:	02/11/23

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.2	50	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	0.2	20	no	N
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	0.1	1	no	N
Forb (FG)	*Urtica incisa (Stinging Nettle)*	0.1	1	no	N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	0.5	1	no	N
Forb (FG)	*Senecio prenanthoides*	0.1	1	no	N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	1	no	N
Grass & grasslike (GG)	*Luzula densiflora (Woodrush)*	0.1	10	no	N
Shrub (SG)	*Pimelea curviflora (Rice Flower)*	0.1	1	no	N
Forb (FG)	*Senecio hispidulus (Hill Fireweed)*	0.1	1	no	N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.1	10	no	N
	Medicago spp. (A Medic)	0.1	1	no	E
	Trifolium spp. (A Clover)	0.1	1	no	E
	Stellaria media (Common Chickweed)	0.2	2	no	E
	Solanum chenopodioides (Whitetip Nightshade)	0.5	100	no	E
	Dactylis glomerata (Cocksfoot)	0.1	1	no	E
	Galium aparine (Goosegrass)	0.2	10	no	E

BAM Site – Field Survey Form

Plot ID:	LL01-06-24	**Date:**	04/06/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	228,866	**Recorders:**	Ross_Davey			
Zone:	56	**Northing:**	6,290,325	**IBRA region:**	Hill End		**Midline bearing:**	180
Plant Community Type:		3369: Central Tableland Ranges Peppermint-Gum Grassy Forest		**Condition class:**	Moderate		**PCT confidence:**	
Vegetation Class:		Southern Tableland Grassy Woodlands		**EEC:**			**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	10
	Grasses etc.:	7
	Forbs:	23
	Ferns:	1
	Other:	4
Sum of Cover of native vascular plants by growth form group	Trees:	10
	Shrubs:	2.9
	Grasses etc.:	39.3
	Forbs:	5.7
	Ferns:	0.1
	Other:	0.4
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	91
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	3
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	80	85	65	50	60
Average litter cover (%):	68				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Grassy Woodland. Plot located on a hillside, sloping to the west. Paul Rossington helped on this plot

Plot Disturbance

Little disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Ross_Davey	**Plot ID:**	LL01-06-24	**Date:**	04/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	5	12	no	N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	1	5	no	N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	1	3	no	N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	0.5	6	no	N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	3	15	no	N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.5	4	no	N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	1	20	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	2	40	no	N
Grass & grasslike (GG)	*Rytidosperma setaceum (Small-flowered Wallaby-grass)*	30	1200	no	N
Other (OG)	*Amyema pendula subsp. pendula*	0.1	1	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	3	120	no	N
	Anthoxanthum odoratum (Sweet Vernal Grass)	5	500	no	E
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	3	120	no	N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.5	20	no	N
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	0.2	4	no	N
	Solanum chenopodioides (Whitetip Nightshade)	0.1	1	no	E
Forb (FG)	*Daucus glochidiatus (Native Carrot)*	0.1	1	no	N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.2	50	no	N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.2	15	no	N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	3	6000	no	N
Forb (FG)	*Xerochrysum bracteatum (Golden Everlasting)*	0.1	10	no	N
Shrub (SG)	*Pimelea curviflora (Rice Flower)*	0.1	10	no	N
	Hypochaeris radicata (Catsear)	0.1	10	no	E
Forb (FG)	*Senecio gunnii*	0.1	10	no	N
Shrub (SG)	*Bossiaea buxifolia*	0.1	10	no	N
Forb (FG)	*Brachyscome spathulata*	0.1	20	no	N
	Cirsium vulgare (Spear Thistle)	0.1	10	no	E
Forb (FG)	*Cymbonotus lawsonianus (Bear's Ear)*	0.1	30	no	N
Grass & grasslike (GG)	*Luzula spp.*	0.1	20	no	N
Forb (FG)	*Euchiton japonicus*	0.1	20	no	N
Forb (FG)	*Asperula conferta (Common Woodruff)*	0.1	20	no	N
Forb (FG)	*Acaena spp. (Sheep's Burr)*	0.1	20	no	N
Forb (FG)	*Cynoglossum australe*	0.1	30	no	N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	15	no	N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10	no	E
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	5	no	N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	0.1	10	no	N
Forb (FG)	*Senecio spp. (Groundsel, Fireweed)*	0.1	10	no	N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	20	no	N
Shrub (SG)	*Ozothamnus spp.*	0.1	20	no	N
Forb (FG)	*Geranium spp.*	0.1	10	no	N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	20	no	N
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	10	no	N

Project name:	E221111				
Recorders:	Ross_Davey	Plot ID:	LL01-06-24	Date:	04/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Desmodium gunnii (Slender Tick-trefoil)*	0.1	10	no	N
Forb (FG)	*Solenogyne bellioides (Solengyne)*	0.1	10	no	N
Grass & grasslike (GG)	*Entolasia spp.*	0.2	40	no	N
	Centaurium spp.	0.1	15	no	E
Grass & grasslike (GG)	*Rytidosperma spp.*	1	50	no	N
	Medicago spp. (A Medic)	0.1	20	no	E
Forb (FG)	*Pterostylis spp. (Greenhood)*	0.1	2	no	N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	1	no	HTE
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	20	no	N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	5	no	N
Shrub (SG)	*Indigofera australis (Australian Indigo)*	0.1	1	no	N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	30	no	N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	5	no	N
Shrub (SG)	*Leucopogon lanceolatus*	0.1	1	no	N

BAM Site – Field Survey Form

Plot ID:	LL02	**Date:**	02/11/23	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,052	**Recorders:**	RD, AC		
Zone:	56	**Northing:**	6,289,825	**IBRA region:**	Hill End	**Midline bearing:**	212
Plant Community Type:		3747: Southern Tableland Western Hills Scribbly Gum Forest		**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	10
	Grasses etc.:	6
	Forbs:	7
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	30
	Shrubs:	22.7
	Grasses etc.:	13.5
	Forbs:	1.5
	Ferns:	0
	Other:	0.2
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	102
80 + cm:	0		
50 – 79 cm:	2		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	7
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	60	30	20	60	50
Average litter cover (%):	44				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot on hillside. Sloping to the NW. Dry gravelly soil. Rocky.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD, AC	**Plot ID:**	LL02	**Date:**	02/11/23

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus rossii (Inland Scribbly Gum)*	30	20	no	N
Shrub (SG)	*Hakea dactyloides (Finger Hakea)*	10	32	no	N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	5	5	no	N
Shrub (SG)	*Acacia terminalis (Sunshine Wattle)*	5	45	no	N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	5	50	no	N
Shrub (SG)	*Dillwynia sericea (Egg and Bacon Peas, Parrot Peas)*	1	30	no	N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	5	500	no	N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	0.5	10	no	N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.2	10	no	N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.5	20	no	N
Forb (FG)	*Poranthera microphylla (Small Poranthera)*	0.1	15	no	N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.1	20	no	N
Shrub (SG)	*Phyllanthus hirtellus (Thyme Spurge)*	0.1	30	no	N
Forb (FG)	*Goodenia hederacea (Ivy Goodenia)*	0.1	15	no	N
Grass & grasslike (GG)	*Lepidosperma gunnii*	1	30	no	N
Shrub (SG)	*Acacia gunnii (Ploughshare Wattle)*	0.5	10	yes	N
Other (OG)	*Cassytha pubescens (Downy Dodder-laurel)*	0.1	5	no	N
Grass & grasslike (GG)	*Entolasia stricta (Wiry Panic)*	1	30	no	N
Forb (FG)	*Bossiaea prostrata*	0.1	5	no	N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.5	30	no	N
Shrub (SG)	*Gompholobium uncinatum (Red Wedge Pea)*	0.2	5	no	N
Shrub (SG)	*Acacia ulicifolia (Prickly Moses)*	0.2	5	no	N
Grass & grasslike (GG)	*Themeda triandra*	0.5	50	no	N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	1	30	no	N
Forb (FG)	*Goodenia bellidifolia*	0.1	20	no	N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	5	no	N

BAM Site – Field Survey Form

Plot ID:	LL02-06-24	**Date:**	04/06/24	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,857	**Recorders:**	Paul_Rossington		
Zone:	56	**Northing:**	6,290,529	**IBRA region:**	Hill End	**Midline bearing:**	218
Plant Community Type:		3369: Central Tableland Ranges Peppermint-Gum Grassy Forest		**Condition class:**	Moderate	**PCT confidence:**	
Vegetation Class:		Southern Tableland Grassy Woodlands		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	6
	Grasses etc.:	7
	Forbs:	22
	Ferns:	1
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	19.1
	Shrubs:	7.4
	Grasses etc.:	101.3
	Forbs:	10.7
	Ferns:	0.1
	Other:	0.3
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	84
80 + cm:	0		
50 – 79 cm:	4		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	5
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	25	80	70	20
Average litter cover (%):	45				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot on a hillside sloping to the west. Grassy Woodland. Ross Davey helped on this plot.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul_Rossington	**Plot ID:**	LL02-06-24	**Date:**	04/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus rubida (Candlebark)*	5	5		N
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	10	8		N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	4	6		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	3	10		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	3	10		N
Shrub (SG)	*Leucopogon lanceolatus*	1	4		N
Forb (FG)	*Senecio linearifolius (Fireweed Groundsel)*	0.4	6		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	50	250		N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	5	300		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	30	600		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	1	300		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	2	400		N
Grass & grasslike (GG)	*Lomandra confertifolia (Matrush)*	0.1	5		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	5	100		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.4	100		E
Grass & grasslike (GG)	*Rytidosperma spp.*	15	2000		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	30		N
Forb (FG)	*Euchiton spp. (A Cudweed)*	0.3	150		N
Forb (FG)	*Stackhousia viminea (Slender Stackhousia)*	0.1	2		N
Forb (FG)	*Xerochrysum bracteatum (Golden Everlasting)*	0.2	80		N
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	0.2	10		N
Forb (FG)	*Galium spp.*	0.1	30		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.2	150		N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	2		HTE
Forb (FG)	*Pterostylis spp. (Greenhood)*	0.1	50		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	4		N
Forb (FG)	*Plantago varia*	0.1	2		N
	Hypochaeris radicata (Catsear)	0.1	80		E
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	1		E
Forb (FG)	*Acaena spp. (Sheep's Burr)*	0.1	2		N
Forb (FG)	*Senecio gunnii*	0.1	3		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	2		N
Forb (FG)	*Poranthera microphylla (Small Poranthera)*	0.1	1		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	1	400		N
Forb (FG)	*Acianthus spp. (Mosquito Orchid)*	0.1	2		N
Fern (EG)	*Pteridium esculentum (Bracken)*	0.1	2		N
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.1	1		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.2	20		N
Tree (TG)	*Allocasuarina littoralis (Black She-Oak)*	0.1	1		N
Forb (FG)	*Daucus glochidiatus (Native Carrot)*	0.1	4		N
Other (OG)	*Glycine clandestina (broad leaf form) (Scott's Head Broad-Leaved Glycine)*	0.1	1		N
Grass & grasslike (GG)	*Cyperus spp.*	0.2	8		N
Forb (FG)	*Solenogyne bellioides (Solengyne)*	0.1	10		N

Project name:	E221111				
Recorders:	Paul_Rossington	**Plot ID:**	LL02-06-24	**Date:**	04/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	1		N
Forb (FG)	*Cynoglossum australe*	0.1	1		N
Forb (FG)	*Wahlenbergia spp. (Bluebell)*	0.1	1		N
Shrub (SG)	*Bossiaea spp.*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	LL03	**Date:**	03/11/23	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,388	**Recorders:**	AC, RD		
Zone:	56	**Northing:**	6,290,389	**IBRA region:**	Hill End	**Midline bearing:**	212
Plant Community Type:		3735: Central Tableland Peppermint Shrub-Grass Forest		**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	6
	Grasses etc.:	6
	Forbs:	16
	Ferns:	1
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	40
	Shrubs:	1.8
	Grasses etc.:	61.1
	Forbs:	3.2
	Ferns:	0.4
	Other:	0.3
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	98
80 + cm:	0		
50 – 79 cm:	4		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	4
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	90	80	95	95	95
Average litter cover (%):	91				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot located on a hillside, sloping to the east. Dry loamy soils.

Plot Disturbance

Minimal disturbance in the form of pigs churning up the soil

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	AC, RD	**Plot ID:**	LL03	**Date:**	03/11/23

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	10	7	no	N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	5	3	no	N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	25	2	no	N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.7	4	no	N
Forb (FG)	*Stypandra glauca (Nodding Blue Lily)*	0.5	1	no	N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.3	5	no	N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.5	100	no	N
Shrub (SG)	*Leucopogon lanceolatus*	0.1	2	no	N
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.1	10	no	N
Fern (EG)	*Pteridium esculentum (Bracken)*	0.4	10	no	N
Forb (FG)	*Goodenia hederacea (Ivy Goodenia)*	0.1	1	no	N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	5	50	no	N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	15	200	no	N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	15	400	no	N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	25	500	no	N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	10	no	N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	10	no	N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	10	no	N
Forb (FG)	*Stackhousia monogyna (Creamy Candles)*	0.1	10	no	N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.4	200	no	N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	1	100	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.1	10	no	N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	10	no	N
Forb (FG)	*Euchiton spp. (A Cudweed)*	0.1	1	no	N
Forb (FG)	*Poranthera microphylla (Small Poranthera)*	0.1	1	no	N
Forb (FG)	*Cymbonotus lawsonianus (Bear's Ear)*	0.1	1	no	N
Forb (FG)	*Senecio linearifolius (Fireweed Groundsel)*	0.1	1	no	N
Grass & grasslike (GG)	*Austrostipa rudis*	1	50	no	N
	Cirsium vulgare (Spear Thistle)	0.1	1	no	E
	Anthoxanthum odoratum (Sweet Vernal Grass)	15	800	no	E
	Hypochaeris radicata (Catsear)	0.1	10	no	E
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	0.1	3	no	N
Forb (FG)	*Pomax umbellata (Pomax)*	0.1	5	no	N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	2	no	N
Forb (FG)	*Senecio prenanthoides*	0.1	2	no	N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	1	no	N
Forb (FG)	*Wahlenbergia spp. (Bluebell)*	0.1	1	no	N
Shrub (SG)	*Leucopogon spp. (A Beard-heath)*	0.1	1	no	N
	Rubus anglocandicans (Blackberry)	0.1	1	no	E

BAM Site – Field Survey Form

Plot ID:	LL03-06-24	**Date:**	04/06/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	228,565	**Recorders:**	Ross_Davey			
Zone:	56	**Northing:**	6,289,269	**IBRA region:**	Hill End		**Midline bearing:**	193
Plant Community Type:		3367: Central Tableland Granites Grassy Box Woodland			**Condition class:**	Poor	**PCT confidence:**	
Vegetation Class:		Southern Tableland Grassy Woodlands			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	3
	Grasses etc.:	5
	Forbs:	16
	Ferns:	1
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	8.2
	Shrubs:	0.7
	Grasses etc.:	25.5
	Forbs:	3.8
	Ferns:	0.1
	Other:	0.1
High Threat Weed cover:		65.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	9
80 + cm:	1		
50 – 79 cm:	1		
30 – 49 cm:	0		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	90	70	40	60
Average litter cover (%):	58				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Paul Rossington helped on this plot.

Plot Disturbance

Grazed, heavily infested with blackberry.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Ross_Davey	**Plot ID:**	LL03-06-24	**Date:**	04/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus bridgesiana (Apple Box)*	3	6		N
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	1	3		N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	0.2	5		N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	4	15		N
Shrub (SG)	*Cassinia sifton*	0.5	8		N
	Rubus fruticosus sp. agg. (Blackberry complex)	40	200		HTE
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	15	600		N
Grass & grasslike (GG)	*Rytidosperma racemosum (Wallaby Grass)*	10	500		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.1	4		N
	Solanum chenopodioides (Whitetip Nightshade)	0.1	5		E
Forb (FG)	*Acaena spp. (Sheep's Burr)*	0.3	60		N
Forb (FG)	*Solenogyne bellioides (Solengyne)*	0.5	80		N
	Hypochaeris radicata (Catsear)	0.2	40		E
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	30		N
	Acetosella vulgaris (Sheep Sorrel)	0.5	50		HTE
Forb (FG)	*Oxalis spp.*	0.1	50		N
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	20		E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	1		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	10	400		E
	Hypericum perforatum subsp. veronense (St John's Wort)	1	100		E
Grass & grasslike (GG)	*Themeda triandra*	0.1	30		N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.5	50		N
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	0.1	3		N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	10		N
	Cirsium vulgare (Spear Thistle)	0.1	5		E
	Verbena bonariensis (Purpletop)	0.1	5		E
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	30		N
Forb (FG)	*Cymbonotus lawsonianus (Bear's Ear)*	1	80		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.2	10		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.2	40		N
	Modiola caroliniana (Red-flowered Mallow)	0.1	15		E
Forb (FG)	*Geranium spp.*	0.1	20		N
	Nassella trichotoma (Serrated Tussock)	25	200		HTE
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	10		N
	Paronychia spp.	0.1	20		E
Forb (FG)	*Einadia hastata (Berry Saltbush)*	0.2	40		N
Forb (FG)	*Lepidium pseudotasmanicum*	0.1	15		N
Forb (FG)	*Asperula scoparia (Prickly Woodruff)*	0.1	20		N
	Medicago spp. (A Medic)	0.1	20		E
Grass & grasslike (GG)	*Eragrostis leptostachya (Paddock Lovegrass)*	0.2	40		N
Forb (FG)	*Scleranthus biflorus (Two-flowered Knawel)*	0.1	10		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	5		N
Forb (FG)	*Euchiton japonicus*	0.2	40		N

Project name:	E221111				
Recorders:	Ross_Davey	**Plot ID:**	LL03-06-24	**Date:**	04/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	15		N

BAM Site – Field Survey Form

Plot ID:	LL04	**Date:**	03/11/23	**Project number:**	E221111			**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,477	**Recorders:**	RD, AC				
Zone:	56	**Northing:**	6,290,990	**IBRA region:**	Hill End			**Midline bearing:**	106
Plant Community Type:			3211: Central Tableland Montane Wet Forest			**Condition class:**	Moderate	**PCT confidence:**	
Vegetation Class:			Southern Escarpment Wet Sclerophyll Forests			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	3
	Grasses etc.:	5
	Forbs:	12
	Ferns:	2
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	50
	Shrubs:	24.1
	Grasses etc.:	65.4
	Forbs:	22.2
	Ferns:	1.1
	Other:	0.6
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	129
80 + cm:	3		
50 – 79 cm:	1		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	1
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	90	10	15	20	5
Average litter cover (%):	28				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot located of hillside sloping to the south. Dry loamy soil. Metamorphic small boulders.

Plot Disturbance

Minimal disturbance in the form of pigs digging up the soil in places.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD, AC	**Plot ID:**	LL04	**Date:**	03/11/23

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus fastigata (Brown Barrel)*	50	3	no	N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	20	8	no	N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	5	35	no	N
Fern (EG)	*Pteridium esculentum (Bracken)*	1	30	no	N
Shrub (SG)	*Leucopogon lanceolatus*	4	15	no	N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	10	500	no	N
Forb (FG)	*Senecio linearifolius (Fireweed Groundsel)*	0.5	20	no	N
	Anthoxanthum odoratum (Sweet Vernal Grass)	30	3000	no	E
	Conyza spp. (A Fleabane)	0.1	10	no	E
Grass & grasslike (GG)	*Entolasia stricta (Wiry Panic)*	30	3000	no	N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	5	5000	no	N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	30	no	N
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.5	30	no	N
Fern (EG)	*Asplenium flabellifolium (Necklace Fern)*	0.1	30	no	N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.1	10	no	N
Forb (FG)	*Galium leiocarpum*	0.1	15	no	N
Forb (FG)	*Viola hederacea (Ivy-leaved Violet)*	1	1000	no	N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	15	no	N
Shrub (SG)	*Rubus parvifolius (Native Raspberry)*	0.1	15	no	N
Forb (FG)	*Lagenifera stipitata (Blue Bottle-daisy)*	0.1	30	no	N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	30	no	N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.4	10	no	N
Forb (FG)	*Arthropodium milleflorum (Pale Vanilla-lily)*	5	300	no	N
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	15	500	no	N
Forb (FG)	*Bulbine bulbosa (Bulbine Lily)*	0.1	10	no	N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.1	3	no	N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	15	1500	no	N

BAM Site – Field Survey Form

Plot ID:	LL04-06-24	**Date:**	05/06/24	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	228,798	**Recorders:**	Paul_Rossington		
Zone:	56	**Northing:**	6,289,805	**IBRA region:**	Hill End	**Midline bearing:**	242
Plant Community Type:		3735: Central Tableland Peppermint Shrub-Grass Forest		**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	9
	Grasses etc.:	12
	Forbs:	15
	Ferns:	1
	Other:	4
Sum of Cover of native vascular plants by growth form group	Trees:	17.5
	Shrubs:	5.5
	Grasses etc.:	17.8
	Forbs:	29.4
	Ferns:	1
	Other:	0.4
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	51
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	25	80	20	40	80
Average litter cover (%):	49				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Grassy /shrubby woodland (intermediate between the two). Land sloping north west down to the Lake. Rocky. Ross Davey helped on this plot.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul_Rossington	**Plot ID:**	LL04-06-24	**Date:**	05/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	15	20		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	2	4		N
Shrub (SG)	*Acacia obtusifolia*	1	10		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	1	15		N
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	0.8	200		N
Shrub (SG)	*Cassinia sifton*	0.2	40		N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	0.5	2		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.4	200		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.4	30		N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.2	20		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.3	40		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	1	2000		N
Shrub (SG)	*Bossiaea buxifolia*	1	80		N
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	0.2	5		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	2	2000		N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	5	2000		N
Other (OG)	*Cuscuta spp. (Dodder)*	0.1	5		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	20		N
	Hypochaeris radicata (Catsear)	0.2	200		E
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.4	500		E
Grass & grasslike (GG)	*Lepidosperma laterale (Variable Sword-sedge)*	0.1	2		N
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	0.3	200		N
Grass & grasslike (GG)	*Dichelachne rara*	0.4	400		N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	20	2000		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	20		N
Forb (FG)	*Wahlenbergia spp. (Bluebell)*	0.1	1		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	1	1000		N
Forb (FG)	*Pterostylis spp. (Greenhood)*	5	500		N
Forb (FG)	*Goodenia heterophylla*	0.1	40		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	5	500		N
Forb (FG)	*Laxmannia gracilis (Slender Wire Lily)*	0.1	1		N
Forb (FG)	*Stylidium graminifolium (Grass Triggerplant)*	0.1	8		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	1		N
Grass & grasslike (GG)	*Rytidosperma spp.*	0.4	200		N
Grass & grasslike (GG)	*Cymbopogon refractus (Barbed Wire Grass)*	2	300		N
	Acetosa sagittata (Rambling Dock)	0.1	2		HTE
Forb (FG)	*Crassula sieberiana (Australian Stonecrop)*	0.1	1		N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	1		N
Shrub (SG)	*Leucopogon pilifer (Thready Beard-heath)*	0.6	30		N
Forb (FG)	*Xerochrysum bracteatum (Golden Everlasting)*	0.1	2		N
Forb (FG)	*Senecio gunnii*	0.1	1		N
	Hypericum perforatum subsp. veronense (St John's Wort)	0.1	4		E
Grass & grasslike (GG)	*Lepidosperma urophorum*	4	200		N

Project name:	E221111				
Recorders:	Paul_Rossington	**Plot ID:**	LL04-06-24	**Date:**	05/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Conyza spp. (A Fleabane)	0.1	1		E
Forb (FG)	*Oxalis perennans*	0.1	1		N
Forb (FG)	*Opercularia varia (Variable Stinkweed)*	0.1	1		N
Grass & grasslike (GG)	*Lomandra confertifolia (Matrush)*	0.1	2		N
Grass & grasslike (GG)	*Entolasia spp.*	0.2	20		N
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	LL05	**Date:**	12/02/24	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	228,659	**Recorders:**	NM RD		
Zone:	56	**Northing:**	6,290,033	**IBRA region:**	Hill End	**Midline bearing:**	45
Plant Community Type:		3735: Central Tableland Peppermint Shrub-Grass Forest		**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	5
	Shrubs:	8
	Grasses etc.:	4
	Forbs:	14
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	43.2
	Shrubs:	7.6
	Grasses etc.:	25.2
	Forbs:	6.7
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	75
80 + cm:	0		
50 – 79 cm:	1		
30 – 49 cm:	4		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	25	60	35	40
Average litter cover (%):	38				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Lower slopes in hill landscape, brown loamy souls, steep slope with SE aspect

Plot Disturbance

Weeds. Track to SE. Note plot is > 50m from track edge.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM RD	**Plot ID:**	LL05	**Date:**	12/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus rubida (Candlebark)*	15	5		N
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	25	8		N
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	1	2		N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	2	3		N
Tree (TG)	*Acacia doratoxylon (Currawang)*	0.2	1		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	1	4		N
Shrub (SG)	*Lissanthe strigosa subsp. subulata (Peach Heath)*	0.2	4		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	5		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	5	100		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	35	1650		E
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	5	50		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	20	400		N
Shrub (SG)	*Gompholobium uncinatum (Red Wedge Pea)*	0.1	10		N
Forb (FG)	*Brachyscome spathulata*	0.1	20		N
	Hypochaeris radicata (Catsear)	0.1	20		E
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	10		HTE
Forb (FG)	*Stackhousia viminea (Slender Stackhousia)*	0.1	10		N
Forb (FG)	*Euchiton japonicus*	0.1	20		N
Grass & grasslike (GG)	*Schoenus apogon (Fluke Bogrush)*	0.1	10		N
Shrub (SG)	*Cassinia sifton*	0.1	5		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.1	5		N
Grass & grasslike (GG)	*Austrostipa rudis subsp. nervosa (A Speargrass)*	5	200		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.1	5		N
Forb (FG)	*Senecio diaschides*	0.1	10		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	20		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	20		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.5	10		N
	Cirsium vulgare (Spear Thistle)	0.1	5		E
Forb (FG)	*Ranunculus lappaceus (Common Buttercup)*	0.1	20		N
Forb (FG)	*Acaena echinata (Sheep's Burr)*	0.1	20		N
	Centaurium tenuiflorum (Branched Centaury, Slender centaury)	0.1	10		E
Forb (FG)	*Eriochilus cucullatus (Parson's Bands)*	0.1	5		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	10		N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	30		N
Shrub (SG)	*Acrotriche serrulata (Honeypots)*	1	50		N
Forb (FG)	*Senecio prenanthoides*	0.1	20		N

BAM Site – Field Survey Form

Plot ID:	LL05-06-24	**Date:**	05/06/24	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	228,740	**Recorders:**	Ross_Davey		
Zone:	56	**Northing:**	6,289,607	**IBRA region:**	Hill End	**Midline bearing:**	222
Plant Community Type:		3347: Southern Tableland Creekflat Ribbon Gum Forest		**Condition class:**	DEGH	**PCT confidence:**	
Vegetation Class:		Tableland Clay Grassy Woodlands		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	0
	Grasses etc.:	7
	Forbs:	3
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0.2
	Shrubs:	0
	Grasses etc.:	1.9
	Forbs:	0.3
	Ferns:	0
	Other:	0
High Threat Weed cover:		80

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	**Tree hollow count**	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	30	10	60	35	25
Average litter cover (%):	32				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Loamy, clayey soil on flat area next to the lake. Paul Rossington helped on this plot.

Plot Disturbance

Blackberry gone wild. Evidence of pigs tearing up soil.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Ross_Davey	**Plot ID:**	LL05-06-24	**Date:**	05/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Rubus fruticosus sp. agg. (Blackberry complex)	80	500		HTE
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	0.5	5		N
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.5	5		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.2	25		N
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	0.2	10		N
Tree (TG)	*Acacia dealbata (Silver Wattle)*	0.2	1		N
Grass & grasslike (GG)	*Rytidosperma spp.*	0.1	5		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.5	50		E
	Taraxacum officinale (Dandelion)	0.1	10		E
	Hypochaeris radicata (Catsear)	0.1	15		E
Forb (FG)	*Geranium spp.*	0.1	20		N
	Cirsium vulgare (Spear Thistle)	0.1	5		E
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	5		E
Grass & grasslike (GG)	*Festuca spp.*	0.3	40		N
	Trifolium repens (White Clover)	0.1	20		E
	Dactylis glomerata (Cocksfoot)	15	600		E
	Avena spp. (Oats)	0.1	20		E
Grass & grasslike (GG)	*Cyperus polystachyos*	0.1	10		N
	Modiola caroliniana (Red-flowered Mallow)	0.1	20		E
	Hypericum perforatum subsp. veronense (St John's Wort)	0.1	10		E
Forb (FG)	*Epilobium spp.*	0.1	3		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	5		N
	Setaria parviflora	0.1	20		E

BAM Site – Field Survey Form

Plot ID:	LL06	**Date:**	12/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,018	**Recorders:**	NM, RD			
Zone:	56	**Northing:**	6,290,335	**IBRA region:**	Hill End		**Midline bearing:**	350
Plant Community Type:		3747: Southern Tableland Western Hills Scribbly Gum Forest		**Condition class:**	High		**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**			**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	11
	Grasses etc.:	4
	Forbs:	11
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	23
	Shrubs:	4.7
	Grasses etc.:	34.2
	Forbs:	2
	Ferns:	0.1
	Other:	0.3
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	65
80 + cm:	0		
50 – 79 cm:	4		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	5
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	50	20	90	60
Average litter cover (%):	50				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot located on western facing slope. Dry, rocky substrate.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL06	**Date:**	12/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus rossii (Inland Scribbly Gum)*	20	10		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	3	5		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.5	10		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	1	20		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	1	200		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.2	50		E
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	30	300		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.2	30		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.3	30		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.2	50		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	3	100		N
Forb (FG)	*Brachyscome spathulata*	0.1	20		N
Shrub (SG)	*Leucopogon lanceolatus*	0.1	1		N
Shrub (SG)	*Acacia spp. (Wattle)*	0.1	1		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	3	3		N
Shrub (SG)	*Platysace ericoides*	0.2	100		N
Shrub (SG)	*Indigofera australis (Australian Indigo)*	0.1	3		N
Shrub (SG)	*Cassinia sifton*	0.1	2		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	20		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	20		N
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	0.1	2		N
Forb (FG)	*Senecio prenanthoides*	0.1	25		N
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	0.1	3		N
	Hypochaeris radicata (Catsear)	0.1	10		E
Forb (FG)	*Pomax umbellata (Pomax)*	0.1	10		N
	Rubus anglocandicans (Blackberry)	0.1	10		E
	Conyza spp. (A Fleabane)	0.1	2		E
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.1	1		N
Forb (FG)	*Stackhousia viminea (Slender Stackhousia)*	0.1	10		N
Shrub (SG)	*Lissanthe strigosa subsp. subulata (Peach Heath)*	0.1	2		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	5		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	3		N
Forb (FG)	*Euchiton spp. (A Cudweed)*	0.1	2		N
Forb (FG)	*Poranthera microphylla (Small Poranthera)*	0.1	5		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	2		N

BAM Site – Field Survey Form

Plot ID:	LL06-06-24	**Date:**	05/06/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	228,831	**Recorders:**	Paul_Rossington			
Zone:	56	**Northing:**	6,289,535	**IBRA region:**	Hill End		**Midline bearing:**	236
Plant Community Type:		3367: Central Tableland Granites Grassy Box Woodland			**Condition class:**	Moderate	**PCT confidence:**	
Vegetation Class:		Southern Tableland Grassy Woodlands			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	12
	Grasses etc.:	11
	Forbs:	13
	Ferns:	1
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	16
	Shrubs:	4.2
	Grasses etc.:	28.4
	Forbs:	4.4
	Ferns:	0.1
	Other:	0.1
High Threat Weed cover:		0.5

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	20
80 + cm:	0		
50 – 79 cm:	3		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	50	80	20	60	30
Average litter cover (%):	48				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Rocky soil. Land sloping to the west. Ross Davey helped on this plot.

Plot Disturbance

Semi cleared in the past.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	Paul_Rossington	**Plot ID:**	LL06-06-24	**Date:**	05/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus bridgesiana (Apple Box)*	8	5		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	3	2		N
Tree (TG)	*Eucalyptus melliodora (Yellow Box)*	3	5		N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	2	4		N
Shrub (SG)	*Acacia filicifolia (Fern-leaved Wattle)*	1	8		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.3	10		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.2	4		N
Shrub (SG)	*Cassinia sifton*	0.6	30		N
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	0.3	8		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.2	5		N
Other (OG)	*Desmodium varians (Slender Tick-trefoil)*	0.1	7		N
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.2	30		N
Grass & grasslike (GG)	*Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)*	2	40		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	50		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	2	500		N
	Hypericum perforatum subsp. veronense (St John's Wort)	1	700		E
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	2	200		N
	Nassella trichotoma (Serrated Tussock)	0.4	30		HTE
Shrub (SG)	*Bossiaea buxifolia*	0.1	4		N
Grass & grasslike (GG)	*Lomandra confertifolia (Matrush)*	15	3000		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	300		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	200		N
	Hypochaeris radicata (Catsear)	0.1	20		E
Grass & grasslike (GG)	*Entolasia spp.*	0.1	8		N
Forb (FG)	*Euchiton spp. (A Cudweed)*	0.1	2		N
Grass & grasslike (GG)	*Dichelachne spp. (A Plumegrass)*	0.3	40		N
Forb (FG)	*Oxalis perennans*	0.1	1		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	1		N
Forb (FG)	*Acaena spp. (Sheep's Burr)*	0.2	30		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.2	10		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.3	100		N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	2		HTE
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	4	1000		N
Grass & grasslike (GG)	*Rytidosperma spp.*	0.4	200		N
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	1	80		N
Grass & grasslike (GG)	*Themeda triandra*	0.4	40		N
Forb (FG)	*Goodenia hederacea (Ivy Goodenia)*	0.1	1		N
Shrub (SG)	*Pimelea curviflora (Rice Flower)*	0.1	3		N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	2	300		N
Forb (FG)	*Opercularia varia (Variable Stinkweed)*	0.1	2		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	1	20		N
Shrub (SG)	*Astroloma humifusum (Native Cranberry)*	0.1	1		N
Shrub (SG)	*Exocarpos cupressiformis (Cherry Ballart)*	0.1	1		N

Project name:	E221111				
Recorders:	Paul_Rossington	**Plot ID:**	LL06-06-24	**Date:**	05/06/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Brachyscome spp.*	0.1	1		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	2		N
	Centaurium tenuiflorum (Branched Centaury, Slender centaury)	0.1	4		E
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	1		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	LL07	**Date:**	12/02/24	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,154	**Recorders:**	RD, NM		
Zone:	56	**Northing:**	6,290,209	**IBRA region:**	Hill End	**Midline bearing:**	85
Plant Community Type:		3735: Central Tableland Peppermint Shrub-Grass Forest		**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	5
	Grasses etc.:	6
	Forbs:	12
	Ferns:	2
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	65
	Shrubs:	24.1
	Grasses etc.:	55.5
	Forbs:	2.5
	Ferns:	1.1
	Other:	0.3
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	200
80 + cm:	0		
50 – 79 cm:	4		
30 – 49 cm:	1		
20 – 29 cm:	1	**Tree hollow count**	3
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	85	70	65	90	55
Average litter cover (%):	73				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Steep hills, brown loamy soils, metamorphic rocks, south aspect

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD, NM	**Plot ID:**	LL07	**Date:**	12/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	40	8		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	15	4		N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	10	3		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	20	20		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	20	100		N
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	1	15		N
Shrub (SG)	*Leucopogon lanceolatus var. lanceolatus*	1	10		N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	0.5	40		N
Fern (EG)	*Pteridium esculentum (Bracken)*	1	12		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	20		N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	10		HTE
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	30		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	10	400		E
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	15	250		N
Grass & grasslike (GG)	*Austrostipa rudis subsp. nervosa (A Speargrass)*	5	200		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.5	40		N
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.1	15		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	20		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	30		N
	Hypochaeris radicata (Catsear)	0.1	20		E
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	2	5		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	5	200		N
Forb (FG)	*Senecio prenanthoides*	0.1	20		N
Fern (EG)	*Asplenium flabellifolium (Necklace Fern)*	0.1	20		N
Forb (FG)	*Brachyscome spathulata*	0.1	10		N
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	1	15		N
Forb (FG)	*Viola hederacea (Ivy-leaved Violet)*	0.1	30		N
Forb (FG)	*Stackhousia viminea (Slender Stackhousia)*	0.1	20		N
Forb (FG)	*Desmodium gunnii (Slender Tick-trefoil)*	0.1	15		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	20		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	20		N
Forb (FG)	*Calotis cuneifolia (Purple Burr-Daisy)*	0.1	20		N
Forb (FG)	*Pterostylis coccina*	0.1	1		N
	Cirsium vulgare (Spear Thistle)	0.1	5		E
Grass & grasslike (GG)	*Rytidosperma fulvum (Wallaby Grass)*	10	200		N

BAM Site – Field Survey Form

Plot ID:	LL08	**Date:**	13/02/24	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,122	**Recorders:**	NM, RD		
Zone:	56	**Northing:**	6,289,700	**IBRA region:**	Hill End	**Midline bearing:**	250
Plant Community Type:		3735: Central Tableland Peppermint Shrub-Grass Forest		**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	14
	Grasses etc.:	6
	Forbs:	13
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	32.2
	Shrubs:	3
	Grasses etc.:	21.8
	Forbs:	1.7
	Ferns:	0
	Other:	0.2
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	41
80 + cm:	0		
50 – 79 cm:	1		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	2
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	90	80	60	20	40
Average litter cover (%):	58				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot located on a ridge. Sloping to the south. Dry rocky substrate. Quartzite rocks.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL08	**Date:**	13/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	30	25		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	2	1		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.8	10		N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	20	200		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.3	20		N
Forb (FG)	*Wahlenbergia spp. (Bluebell)*	0.1	2		N
Forb (FG)	*Brachyscome spathulata*	0.1	20		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	1	100		N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	2		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.2	50		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.1	20		E
	Hypochaeris radicata (Catsear)	0.1	20		E
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	0.1	4		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.5	50		N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.2	30		N
Forb (FG)	*Senecio prenanthoides*	0.1	10		N
Shrub (SG)	*Acacia implexa (Hickory Wattle)*	0.1	2		N
Shrub (SG)	*Leucopogon spp. (A Beard-heath)*	0.2	30		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.5	300		N
Forb (FG)	*Stackhousia viminea (Slender Stackhousia)*	0.1	10		N
Shrub (SG)	*Cassinia sifton*	0.1	3		N
Grass & grasslike (GG)	*Dichelachne micrantha (Shorthair Plumegrass)*	0.1	10		N
Tree (TG)	*Eucalyptus rossii (Inland Scribbly Gum)*	0.2	1		N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	0.1	2		N
Shrub (SG)	*Leucopogon lanceolatus*	0.1	2		N
Shrub (SG)	*Hakea dactyloides (Finger Hakea)*	0.3	10		N
Shrub (SG)	*Acacia terminalis (Sunshine Wattle)*	0.1	2		N
Shrub (SG)	*Platysace ericoides*	0.1	40		N
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	0.2	20		N
Shrub (SG)	*Lomatia silaifolia (Crinkle Bush)*	0.2	1		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.1	10		N
Shrub (SG)	*Rhytidosporum procumbens*	0.1	5		N
Forb (FG)	*Coronidium scorpioides (Button Everlasting)*	0.1	3		N
Forb (FG)	*Goodenia bellidifolia*	0.1	30		N
Shrub (SG)	*Comesperma ericinum (Pyramid Flower)*	0.1	10		N
Forb (FG)	*Wahlenbergia stricta (Tall Bluebell)*	0.1	10		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	20		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	5		N
	Rubus anglocandicans (Blackberry)	0.1	2		E
Grass & grasslike (GG)	*Dichelachne inaequiglumis*	0.2	50		N

BAM Site – Field Survey Form

Plot ID:	LL09	**Date:**	13/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,339	**Recorders:**	RD,NM			
Zone:	56	**Northing:**	6,289,957	**IBRA region:**	Hill End		**Midline bearing:**	53
Plant Community Type:		3369: Central Tableland Ranges Peppermint-Gum Grassy Forest		**Condition class:**	Moderate		**PCT confidence:**	
Vegetation Class:		Southern Tableland Grassy Woodlands		**EEC:**			**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	7
	Grasses etc.:	8
	Forbs:	18
	Ferns:	1
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	40
	Shrubs:	7.2
	Grasses etc.:	42.2
	Forbs:	2.8
	Ferns:	1
	Other:	0.3
High Threat Weed cover:		0.2

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	70
80 + cm:	0		
50 – 79 cm:	2		
30 – 49 cm:	1		
20 – 29 cm:	1	**Tree hollow count**	2
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	20	10	15	7	30
Average litter cover (%):	16.4				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Steep slope with SE aspect. Quartzite, brown loamy clay soils.

Plot Disturbance

Weeds and feral animals. Track to west - this is a good distance from the plot therefore no edge effects.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD,NM	**Plot ID:**	LL09	**Date:**	13/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus pauciflora (White Sally)*	30	8		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	2	1		N
Tree (TG)	*Eucalyptus viminalis (Ribbon Gum)*	5	1		N
Tree (TG)	*Acacia melanoxylon (Blackwood)*	3	2		N
Shrub (SG)	*Acacia implexa (Hickory Wattle)*	2	4		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	2	6		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	1	5		N
Shrub (SG)	*Leucopogon lanceolatus*	1	4		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	5	15		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	20	800		N
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	5	40		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	40	1600		E
Grass & grasslike (GG)	*Austrostipa rudis subsp. nervosa (A Speargrass)*	5	200		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	5	300		N
Forb (FG)	*Viola hederacea (Ivy-leaved Violet)*	0.2	40		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	1	100		N
Forb (FG)	*Poranthera microphylla (Small Poranthera)*	0.1	30		N
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	20		N
Forb (FG)	*Senecio diaschides*	0.1	10		N
Forb (FG)	*Euchiton japonicus*	0.1	20		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	0.1	30		N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	20		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	20		N
	Hypochaeris radicata (Catsear)	0.1	20		E
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	5		HTE
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.2	10		N
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	20		E
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
	Cirsium vulgare (Spear Thistle)	0.1	20		E
Shrub (SG)	*Lissanthe strigosa (Peach Heath)*	0.1	5		N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	0.1	10		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	20		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	5		N
Forb (FG)	*Arthropodium milleflorum (Pale Vanilla-lily)*	0.1	5		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	20		N
	Prunella vulgaris (Self-heal)	0.1	10		E
	Hypericum perforatum (St. Johns Wort)	0.1	20		HTE
Fern (EG)	*Adiantum aethiopicum (Common Maidenhair)*	1	20		N
Forb (FG)	*Ranunculus lappaceus (Common Buttercup)*	0.1	20		N
	Sonchus asper (Prickly Sowthistle)	0.1	5		E
Forb (FG)	*Senecio hispidulus (Hill Fireweed)*	0.1	20		N
	Phytolacca octandra (Inkweed)	0.1	5		E
	Solanum nigrum (Black-berry Nightshade)	0.1	20		E

Project name:	E221111				
Recorders:	RD,NM	**Plot ID:**	LL09	**Date:**	13/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
	Plantago lanceolata (Lamb's Tongues)	0.1	20		E
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	20		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	20		N
	Galium aparine (Goosegrass)	0.1	10		E
Shrub (SG)	*Leucopogon lanceolatus var. lanceolatus*	1	5		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	1	80		N
Forb (FG)	*Oxalis spp.*	0.1	20		N
Shrub (SG)	*Gompholobium uncinatum (Red Wedge Pea)*	0.1	5		N
Grass & grasslike (GG)	*Rytidosperma fulvum (Wallaby Grass)*	1	80		N
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.2	20		N

BAM Site – Field Survey Form

Plot ID:	LL10	**Date:**	13/02/24	**Project number:**	E221111	**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,531	**Recorders:**	NM, RD		
Zone:	56	**Northing:**	6,290,113	**IBRA region:**	Hill End	**Midline bearing:**	139
Plant Community Type:		3735: Central Tableland Peppermint Shrub-Grass Forest		**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	11
	Grasses etc.:	14
	Forbs:	28
	Ferns:	2
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	30
	Shrubs:	2.5
	Grasses etc.:	51.1
	Forbs:	3.2
	Ferns:	0.2
	Other:	0.2
High Threat Weed cover:		0.2

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	81
80 + cm:	0		
50 – 79 cm:	3		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	3
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	50	80	90	70	70
Average litter cover (%):	72				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot on a hillside. Sloping to the SW. Grassy understory.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL10	**Date:**	13/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	22	20		N
Tree (TG)	*Eucalyptus rossii (Inland Scribbly Gum)*	1	1		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	1	7		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	20	80		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.2	40		N
Forb (FG)	*Brachyscome spathulata*	0.1	30		N
Forb (FG)	*Senecio prenanthoides*	0.1	30		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	25	400		N
	Rubus anglocandicans (Blackberry)	0.1	20		E
Grass & grasslike (GG)	*Lomandra confertifolia (Matrush)*	0.1	1		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	20		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	1	80		N
	Hypochaeris radicata (Catsear)	0.1	50		E
	Hypericum perforatum (St. Johns Wort)	0.1	3		HTE
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	30		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	50		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	100		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	7	3		N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	0.2	20		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	0.5	3		N
Forb (FG)	*Euchiton japonicus*	0.1	30		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	20		N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	40		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.5	30		N
Shrub (SG)	*Cassinia sifton*	0.1	10		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	2	100		E
Forb (FG)	*Oxalis perennans*	0.1	10		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	10		N
	Solanum nigrum (Black-berry Nightshade)	0.1	1		E
Forb (FG)	*Cymbonotus lawsonianus (Bear's Ear)*	0.1	10		N
Shrub (SG)	*Bossiaea buxifolia*	0.1	10		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	0.1	10		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	30		N
Shrub (SG)	*Lissanthe strigosa subsp. subulata (Peach Heath)*	0.1	2		N
Grass & grasslike (GG)	*Rytidosperma racemosum var. racemosum (Wallaby Grass)*	2	200		N
Forb (FG)	*Acaena echinata (Sheep's Burr)*	0.1	30		N
	Plantago lanceolata (Lamb's Tongues)	0.1	10		E
Grass & grasslike (GG)	*Austrostipa rudis subsp. nervosa (A Speargrass)*	0.1	3		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	20		N
Shrub (SG)	*Leucopogon lanceolatus*	0.1	2		N
Forb (FG)	*Stackhousia viminea (Slender Stackhousia)*	0.1	20		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.1	3		N
Forb (FG)	*Brachyscome rigidula (Hairy Cutleaf Daisy)*	0.1	10		N

Project name:	E221111				
Recorders:	NM, RD	Plot ID:	LL10	Date:	13/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Ajuga australis (Austral Bugle)*	0.1	30		N
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	0.1	2		N
Grass & grasslike (GG)	*Aristida jerichoensis var. jerichoensis (Jericho Wiregrass)*	0.1	10		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.1	2		N
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	0.2	20		N
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	15		N
Forb (FG)	*Goodenia hederacea (Ivy Goodenia)*	0.1	10		N
Forb (FG)	*Cynoglossum australe*	0.1	10		N
	Centaurium erythraea (Common Centaury)	0.1	20		E
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	20		N
Shrub (SG)	*Acacia spp. (Wattle)*	0.1	1		N
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	30		E
Forb (FG)	*Wahlenbergia stricta (Tall Bluebell)*	0.1	20		N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	0.1	2		N
Forb (FG)	*Geranium spp.*	0.1	5		N
	Cirsium vulgare (Spear Thistle)	0.1	2		E
Other (OG)	*Glycine microphylla (Small-leaf Glycine)*	0.1	10		N
Forb (FG)	*Ranunculus lappaceus (Common Buttercup)*	0.1	5		N
Grass & grasslike (GG)	*Lepidosperma laterale (Variable Sword-sedge)*	0.1	2		N
Fern (EG)	*Asplenium flabellifolium (Necklace Fern)*	0.1	10		N
Forb (FG)	*Solanum prinophyllum (Forest Nightshade)*	0.1	1		N
Grass & grasslike (GG)	*Dichelachne inaequiglumis*	0.1	5		N
Forb (FG)	*Mentha diemenica (Slender Mint)*	0.1	20		N
Forb (FG)	*Vittadinia cuneata (A Fuzzweed)*	0.1	1		N
Forb (FG)	*Opercularia aspera (Coarse Stinkweed)*	0.1	20		N
Forb (FG)	*Senecio diaschides*	0.1	5		N
	Senecio jacobaea (Ragwort)	0.1	5		HTE

BAM Site – Field Survey Form

Plot ID:	LL11	**Date:**	13/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,626	**Recorders:**	RD, NM			
Zone:	56	**Northing:**	6,290,316	**IBRA region:**	Hill End		**Midline bearing:**	30
Plant Community Type:		3747: Southern Tableland Western Hills Scribbly Gum Forest		**Condition class:**	High		**PCT confidence:**	
Vegetation Class:		Southern Tableland Dry Sclerophyll Forests		**EEC:**			**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	6
	Grasses etc.:	6
	Forbs:	18
	Ferns:	1
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	40
	Shrubs:	4.4
	Grasses etc.:	83
	Forbs:	1.8
	Ferns:	0.1
	Other:	0.3
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	48
80 + cm:			
50 – 79 cm:	4		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	3
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	75	45	55	80	65
Average litter cover (%):	64				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Steep NW facing slope, rocky, quartzite, brown loamy clay soils

Plot Disturbance

Weeds and feral animals

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD, NM	**Plot ID:**	LL11	**Date:**	13/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus rossii (Inland Scribbly Gum)*	40	15		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	1	2		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	3	8		N
Grass & grasslike (GG)	*Austrostipa rudis subsp. nervosa (A Speargrass)*	45	1800		N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	15	600		N
Grass & grasslike (GG)	*Aristida calycina*	5	200		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	15	300		N
Grass & grasslike (GG)	*Lepidosperma laterale (Variable Sword-sedge)*	2	25		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	10		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	30		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	1	40		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	20		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.1	20		N
Other (OG)	*Glycine microphylla (Small-leaf Glycine)*	0.1	15		N
Forb (FG)	*Coronidium spp.*	0.1	10		N
Forb (FG)	*Senecio diaschides*	0.1	5		N
Forb (FG)	*Brachyscome rigidula (Hairy Cutleaf Daisy)*	0.1	10		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	15		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	20		N
Fern (EG)	*Cheilanthes sieberi (Rock Fern)*	0.1	5		N
Shrub (SG)	*Bossiaea buxifolia*	0.1	20		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.1	3		N
Forb (FG)	*Hybanthus spp.*	0.1	5		N
	Hypochaeris radicata (Catsear)	0.1	10		E
Forb (FG)	*Euchiton japonicus*	0.1	10		N
Forb (FG)	*Desmodium gunnii (Slender Tick-trefoil)*	0.1	5		N
Forb (FG)	*Opercularia hispida (Hairy Stinkweed)*	0.1	5		N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	10		N
Forb (FG)	*Arthropodium milleflorum (Pale Vanilla-lily)*	0.1	5		N
Other (OG)	*Glycine tabacina (Variable Glycine)*	0.1	20		N
Shrub (SG)	*Astroloma humifusum (Native Cranberry)*	0.1	5		N
Forb (FG)	*Vittadinia cuneata (A Fuzzweed)*	0.1	10		N
Forb (FG)	*Brachyscome spathulata*	0.1	5		N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	5		HTE
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	30		N
	Centaurium erythraea (Common Centaury)	0.1	10		E
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	10		N
	Cirsium vulgare (Spear Thistle)	0.1	3		E
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.1	10		N

BAM Site – Field Survey Form

Plot ID:	LL12	**Date:**	14/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,541	**Recorders:**	NM, RD			
Zone:	56	**Northing:**	6,291,041	**IBRA region:**	Hill End		**Midline bearing:**	244
Plant Community Type:		3211: Central Tableland Montane Wet Forest			**Condition class:**	Moderate	**PCT confidence:**	
Vegetation Class:		Southern Escarpment Wet Sclerophyll Forests			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	5
	Grasses etc.:	6
	Forbs:	18
	Ferns:	3
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	7
	Shrubs:	2.4
	Grasses etc.:	46.4
	Forbs:	27.2
	Ferns:	4.1
	Other:	0.2
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	45
80 + cm:	4		
50 – 79 cm:	5		
30 – 49 cm:	1		
20 – 29 cm:	0	**Tree hollow count**	5
10 – 19 cm:	1		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	20	70	90	90	70
Average litter cover (%):	68				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot on a hillside. Land sloping to the south. Gulley ~20 metres to the SE of the plot (outside the plot).

Plot Disturbance

Some disturbance. Sweet vernal grass and pigs.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL12	**Date:**	14/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus fastigata (Brown Barrel)*	7	3		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	20	30		N
Fern (EG)	*Pteridium esculentum (Bracken)*	2	100		N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	20	200		N
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	25	100		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	5	500		N
Fern (EG)	*Adiantum aethiopicum (Common Maidenhair)*	2	200		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.2	100		N
	Phytolacca octandra (Inkweed)	0.1	3		E
Forb (FG)	*Cymbonotus lawsonianus (Bear's Ear)*	0.1	2		N
Forb (FG)	*Bulbine bulbosa (Bulbine Lily)*	0.1	10		N
	Cirsium vulgare (Spear Thistle)	0.1	2		E
	Lysimachia arvensis (Scarlet Pimpernel)	0.2	100		E
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.1	50		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	1	200		N
Forb (FG)	*Desmodium gunnii (Slender Tick-trefoil)*	0.1	30		N
Shrub (SG)	*Senecio linearifolius var. arachnoideus*	0.5	50		N
Forb (FG)	*Euchiton japonicus*	0.1	40		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	30	1000		E
Forb (FG)	*Wahlenbergia stricta (Tall Bluebell)*	0.1	40		N
Forb (FG)	*Geranium spp.*	0.5	200		N
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.2	10		N
Forb (FG)	*Arthropodium milleflorum (Pale Vanilla-lily)*	0.2	60		N
Forb (FG)	*Senecio prenanthoides*	0.1	20		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	30		N
Other (OG)	*Glycine microphylla (Small-leaf Glycine)*	0.1	10		N
Forb (FG)	*Acaena echinata (Sheep's Burr)*	0.1	10		N
	Solanum nigrum (Black-berry Nightshade)	0.1	2		E
	Hypochaeris radicata (Catsear)	0.1	10		E
Shrub (SG)	*Acacia implexa (Hickory Wattle)*	0.8	2		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	20		N
Shrub (SG)	*Rubus parvifolius (Native Raspberry)*	0.1	5		N
	Conyza spp. (A Fleabane)	0.1	10		E
Forb (FG)	*Ajuga australis (Austral Bugle)*	0.1	10		N
Forb (FG)	*Oxalis spp.*	0.1	30		N
Forb (FG)	*Ranunculus lappaceus (Common Buttercup)*	0.1	10		N
Shrub (SG)	*Lomatia myricoides (River Lomatia)*	0.8	5		N
	Sonchus oleraceus (Common Sowthistle)	0.1	2		E
Fern (EG)	*Asplenium flabellifolium (Necklace Fern)*	0.1	5		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	0.1	10		N
Forb (FG)	*Galium leiocarpum*	0.1	5		N
	Centaurium tenuiflorum (Branched Centaury, Slender centaury)	0.1	1		E
Grass & grasslike (GG)	*Echinopogon ovatus (Forest Hedgehog Grass)*	0.1	5		N

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL12	**Date:**	14/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	0.2	1		N

BAM Site – Field Survey Form

Plot ID:	LL13	**Date:**	14/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,502	**Recorders:**	RD, NM			
Zone:	56	**Northing:**	6,290,953	**IBRA region:**	Hill End		**Midline bearing:**	225
Plant Community Type:		3211: Central Tableland Montane Wet Forest			**Condition class:**	Moderate	**PCT confidence:**	
Vegetation Class:		Southern Escarpment Wet Sclerophyll Forests			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	2
	Grasses etc.:	7
	Forbs:	18
	Ferns:	1
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	20
	Shrubs:	2.1
	Grasses etc.:	21.5
	Forbs:	8.9
	Ferns:	5
	Other:	0.1
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	100
80 + cm:	3		
50 – 79 cm:	2		
30 – 49 cm:	1		
20 – 29 cm:	1	**Tree hollow count**	2
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	0		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	15	25	15	20	30
Average litter cover (%):	21				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Very steep slope, with a south aspect, loamy clay soils, dark brown.

Plot Disturbance

Weeds, pigs

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD, NM	**Plot ID:**	LL13	**Date:**	14/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus fastigata (Brown Barrel)*	20	70		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	2	3		N
Fern (EG)	*Pteridium esculentum (Bracken)*	5	60		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	5	70		N
Grass & grasslike (GG)	*Poa labillardierei var. labillardierei (Tussock)*	3	12		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	5	200		N
Grass & grasslike (GG)	*Anthosachne scabra (Wheatgrass, Common Wheatgrass)*	2	80		N
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.5	40		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	5	200		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	65	2600		E
Forb (FG)	*Arthropodium milleflorum (Pale Vanilla-lily)*	2	120		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	3	600		N
Forb (FG)	*Asperula scoparia (Prickly Woodruff)*	0.1	20		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	30		N
Forb (FG)	*Viola hederacea (Ivy-leaved Violet)*	0.1	20		N
Forb (FG)	*Lagenophora stipitata (Common Lagenophora)*	0.1	20		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	2	400		N
Forb (FG)	*Senecio diaschides*	0.1	10		N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	0.5	40		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	20		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.1	20		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	20		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	20		N
	Cirsium vulgare (Spear Thistle)	0.1	20		E
Forb (FG)	*Euchiton japonicus*	0.1	20		N
Forb (FG)	*Galium leiocarpum*	0.1	10		N
Grass & grasslike (GG)	*Echinopogon ovatus (Forest Hedgehog Grass)*	1	80		N
Forb (FG)	*Wahlenbergia stricta (Tall Bluebell)*	0.1	20		N
Forb (FG)	*Bulbine bulbosa (Bulbine Lily)*	0.1	10		N
	Taraxacum officinale (Dandelion)	0.1	20		E
Forb (FG)	*Acaena novae-zelandiae (Bidgee-widgee)*	0.1	5		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	10		E
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	20		N
Shrub (SG)	*Acacia terminalis (Sunshine Wattle)*	0.1	2		N

BAM Site – Field Survey Form

Plot ID:	LL14	**Date:**	14/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,519	**Recorders:**	NM, RD			
Zone:	56	**Northing:**	6,290,742	**IBRA region:**	Hill End		**Midline bearing:**	271
Plant Community Type:		3211: Central Tableland Montane Wet Forest		**Condition class:**	Moderate		**PCT confidence:**	
Vegetation Class:		Southern Escarpment Wet Sclerophyll Forests		**EEC:**			**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	1
	Grasses etc.:	8
	Forbs:	17
	Ferns:	2
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	17
	Shrubs:	0.2
	Grasses etc.:	6.4
	Forbs:	74.9
	Ferns:	7.1
	Other:	0.1
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	96
80 + cm:	1		
50 – 79 cm:	5		
30 – 49 cm:	1		
20 – 29 cm:	1	**Tree hollow count**	1
10 – 19 cm:	1		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	80	80	80	70	80
Average litter cover (%):	78				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Dry Creek runs through plot. Creek runs to the west.

Plot Disturbance

Some weedy influence. Evidence of pigs.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL14	**Date:**	14/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus fastigata (Brown Barrel)*	10	7		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	1	15		N
Fern (EG)	*Pteridium esculentum (Bracken)*	7	50		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	70	2000		N
Forb (FG)	*Arthropodium milleflorum (Pale Vanilla-lily)*	0.2	50		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	2	200		N
	Cirsium vulgare (Spear Thistle)	1	30		E
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.1	20		N
Grass & grasslike (GG)	*Echinopogon ovatus (Forest Hedgehog Grass)*	1	100		N
Forb (FG)	*Euchiton japonicus*	0.1	30		N
Forb (FG)	*Stellaria pungens (Prickly Starwort)*	0.1	20		N
Forb (FG)	*Geranium solanderi (Native Geranium)*	2	100		N
Forb (FG)	*Oxalis perennans*	0.1	30		N
	Phytolacca octandra (Inkweed)	0.2	20		E
Fern (EG)	*Adiantum aethiopicum (Common Maidenhair)*	0.1	50		N
Forb (FG)	*Desmodium gunnii (Slender Tick-trefoil)*	0.1	30		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	10		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	100		N
Grass & grasslike (GG)	*Austrostipa rudis subsp. nervosa (A Speargrass)*	2	70		N
Forb (FG)	*Senecio linearifolius (Fireweed Groundsel)*	1	50		N
Shrub (SG)	*Rubus parvifolius (Native Raspberry)*	0.2	20		N
Forb (FG)	*Rumex brownii (Swamp Dock)*	0.1	5		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	5	500		E
Forb (FG)	*Acaena echinata (Sheep's Burr)*	0.2	100		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.1	2		N
	Solanum nigrum (Black-berry Nightshade)	0.2	20		E
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	0.1	2		N
Forb (FG)	*Cynoglossum australe*	0.2	40		N
Forb (FG)	*Galium leiocarpum*	0.1	20		N
	Lysimachia arvensis (Scarlet Pimpernel)	0.1	20		E
Grass & grasslike (GG)	*Carex appressa (Tall Sedge)*	0.1	10		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	7	1		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	5		N
Forb (FG)	*Urtica incisa (Stinging Nettle)*	0.2	50		N
Forb (FG)	*Einadia hastata (Berry Saltbush)*	0.2	3		N
	Conyza spp. (A Fleabane)	0.1	5		E
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	0.1	2		N
	Sonchus oleraceus (Common Sowthistle)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	LL15	**Date:**	14/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,607	**Recorders:**	RD, NM			
Zone:	56	**Northing:**	6,290,623	**IBRA region:**	Hill End		**Midline bearing:**	183
Plant Community Type:		3650: Goulburn-Lithgow Ranges Silvertop Ash Forest			**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		South East Dry Sclerophyll Forests			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	9
	Grasses etc.:	3
	Forbs:	4
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	62
	Shrubs:	13.6
	Grasses etc.:	50.4
	Forbs:	1.3
	Ferns:	0
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	118
80 + cm:	0		
50 – 79 cm:	11		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	1
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	70	40	80	85	75
Average litter cover (%):	70				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Soils more loamy, less clay. Quartzite, more weathered and sun beaten. Aspect is west. Steep hill though less steep than brown barrel vegetation.

Plot Disturbance

Low weed cover, less evidence of feral animals

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD, NM	**Plot ID:**	LL15	**Date:**	14/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus sieberi (Silvertop Ash)*	50	15		N
Tree (TG)	*Eucalyptus rossii (Inland Scribbly Gum)*	12	10		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	2	8		N
Shrub (SG)	*Podolobium ilicifolium (Prickly Shaggy Pea)*	10	80		N
Shrub (SG)	*Acacia terminalis (Sunshine Wattle)*	0.5	20		N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	50	1000		N
Shrub (SG)	*Platysace ericoides*	0.2	40		N
Forb (FG)	*Pomax umbellata (Pomax)*	0.1	20		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	10		N
Forb (FG)	*Goodenia hederacea (Ivy Goodenia)*	0.1	20		N
Shrub (SG)	*Bossiaea buxifolia*	0.1	20		N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	1	80		N
Grass & grasslike (GG)	*Entolasia stricta (Wiry Panic)*	0.2	25		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.5	10		N
Grass & grasslike (GG)	*Aristida calycina*	0.2	30		N
Shrub (SG)	*Acacia ulicifolia (Prickly Moses)*	0.1	3		N
Shrub (SG)	*Phyllanthus hirtellus (Thyme Spurge)*	0.1	15		N
Forb (FG)	*Eriochilus cucullatus (Parson's Bands)*	0.1	2		N

BAM Site – Field Survey Form

Plot ID:	LL16	**Date:**	14/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,666	**Recorders:**	NM, RD			
Zone:	56	**Northing:**	6,290,920	**IBRA region:**	Hill End		**Midline bearing:**	321
Plant Community Type:		3650: Goulburn-Lithgow Ranges Silvertop Ash Forest			**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		South East Dry Sclerophyll Forests			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	7
	Grasses etc.:	5
	Forbs:	7
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	27
	Shrubs:	4.4
	Grasses etc.:	37.6
	Forbs:	1.1
	Ferns:	0
	Other:	0.2
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	112
80 + cm:	2		
50 – 79 cm:	4		
30 – 49 cm:	1		
20 – 29 cm:	1	**Tree hollow count**	2
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	70	15	80	30	70
Average litter cover (%):	53				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot on hillside. Sloping to the west. Dry, rocky substrate.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL16	**Date:**	14/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus sieberi (Silvertop Ash)*	22	5		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	2	20		N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	35	200		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	2	50		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	1	7		N
Shrub (SG)	*Leucopogon lanceolatus*	1	5		N
Forb (FG)	*Eriochilus cucullatus (Parson's Bands)*	0.1	3		N
Forb (FG)	*Stylidium graminifolium (Grass Triggerplant)*	0.1	30		N
Forb (FG)	*Poranthera microphylla (Small Poranthera)*	0.1	30		N
Forb (FG)	*Goodenia hederacea (Ivy Goodenia)*	0.1	40		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	20		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.5	100		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. filiformis*	0.2	40		N
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	5	6		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	30		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.1	3		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	0.3	5		N
Shrub (SG)	*Platysace ericoides*	0.1	30		N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	0.1	2		N
	Hypochaeris radicata (Catsear)	0.1	5		E
Grass & grasslike (GG)	*Lomandra confertifolia (Matrush)*	0.1	2		N
Shrub (SG)	*Acacia terminalis (Sunshine Wattle)*	0.1	1		N
Shrub (SG)	*Comesperma ericinum (Pyramid Flower)*	0.1	5		N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	LL17	**Date:**	15/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,763	**Recorders:**	RD, NM			
Zone:	56	**Northing:**	6,290,742	**IBRA region:**	Hill End		**Midline bearing:**	140
Plant Community Type:		3369: Central Tableland Ranges Peppermint-Gum Grassy Forest		**Condition class:**	Moderate		**PCT confidence:**	
Vegetation Class:		Southern Tableland Grassy Woodlands		**EEC:**			**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	10
	Grasses etc.:	5
	Forbs:	17
	Ferns:	0
	Other:	3
Sum of Cover of native vascular plants by growth form group	Trees:	70
	Shrubs:	5.3
	Grasses etc.:	65.3
	Forbs:	11.6
	Ferns:	0
	Other:	0.3
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	59
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	1
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	20	30	75	30
Average litter cover (%):	37				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Steep slope,SSW aspect, loamy clay soils, grey, quartzite

Plot Disturbance

Minor weed, likely feral animals.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	RD, NM	**Plot ID:**	LL17	**Date:**	15/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	60	25		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	10	4		N
Shrub (SG)	*Acacia falciformis (Broad-leaved Hickory)*	2	5		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	2	8		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	30	150		N
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	10	100		N
Grass & grasslike (GG)	*Rytidosperma fulvum (Wallaby Grass)*	20	400		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	20	480		E
Shrub (SG)	*Leucopogon lanceolatus var. lanceolatus*	0.5	4		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	0.2	3		N
	Rubus fruticosus sp. agg. (Blackberry complex)	0.1	5		HTE
Grass & grasslike (GG)	*Lomandra filiformis (Wattle Matt-rush)*	0.2	40		N
Forb (FG)	*Brachyscome spathulata*	0.1	20		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	20		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	20		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.1	10		N
Forb (FG)	*Coronidium spp.*	0.1	10		N
Shrub (SG)	*Astroloma humifusum (Native Cranberry)*	0.1	10		N
Forb (FG)	*Euchiton japonicus*	0.1	10		N
Forb (FG)	*Senecio diaschides*	0.1	10		N
Forb (FG)	*Galium leiocarpum*	0.1	10		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	20		N
Forb (FG)	*Hybanthus spp.*	0.1	10		N
	Hypochaeris radicata (Catsear)	0.1	10		E
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.1	30		N
Forb (FG)	*Plantago debilis (Shade Plantain)*	0.1	10		N
Forb (FG)	*Viola hederacea (Ivy-leaved Violet)*	0.1	30		N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	10		N
Grass & grasslike (GG)	*Cyperus spp.*	0.1	10		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	0.1	30		N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	20		N
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	0.1	20		N
Forb (FG)	*Eriochilus cucullatus (Parson's Bands)*	0.1	3		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	5		N
	Plantago lanceolata (Lamb's Tongues)	0.1	5		E
Shrub (SG)	*Cassinia sifton*	0.1	10		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	10		N
	Plantago major (Large Plantain)	0.1	5		E
Shrub (SG)	*Bossiaea buxifolia*	0.1	10		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	30		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	5		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	5		E
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	15	360		N

Project name:	E221111				
Recorders:	RD, NM	**Plot ID:**	LL17	**Date:**	15/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE

BAM Site – Field Survey Form

Plot ID:	LL18	**Date:**	15/02/24	**Project number:**	E221111		**Plot dimensions:**	
Datum:	GDA94	**Easting:**	229,701	**Recorders:**	NM, RD			
Zone:	56	**Northing:**	6,291,039	**IBRA region:**	Hill End		**Midline bearing:**	156
Plant Community Type:		3650: Goulburn-Lithgow Ranges Silvertop Ash Forest			**Condition class:**	High	**PCT confidence:**	
Vegetation Class:		South East Dry Sclerophyll Forests			**EEC:**		**EEC confidence:**	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	8
	Grasses etc.:	4
	Forbs:	6
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	22.5
	Shrubs:	2.3
	Grasses etc.:	41.2
	Forbs:	0.8
	Ferns:	0
	Other:	0.1
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	**Tree stem count**	**Length of logs (m) (≥10 cm diameter, >50 cm in length)**	96
80 + cm:	1		
50 – 79 cm:	9		
30 – 49 cm:	1		
20 – 29 cm:	1	**Tree hollow count**	5
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	**1**	**2**	**3**	**4**	**5**
Subplot score (%):	50	40	80	40	30
Average litter cover (%):	48				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot located on a hillside sloping to the west. Sparse understory.

Plot Disturbance

No disturbance evident.

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E221111				
Recorders:	NM, RD	**Plot ID:**	LL18	**Date:**	15/02/24

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus sieberi (Silvertop Ash)*	20	8		N
Tree (TG)	*Eucalyptus rubida (Candlebark)*	0.5	1		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.5	5		N
Grass & grasslike (GG)	*Rytidosperma pallidum (Redanther Wallaby Grass; Silvertop Wallaby Grass)*	40	300		N
Shrub (SG)	*Hibbertia obtusifolia (Hoary Guinea Flower)*	0.1	30		N
Shrub (SG)	*Dillwynia phylicoides (Parrot-pea)*	0.2	30		N
Forb (FG)	*Gonocarpus tetragynus (Poverty Raspwort)*	0.2	100		N
Grass & grasslike (GG)	*Poa sieberiana (Snowgrass)*	1	70		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	1	30		N
Forb (FG)	*Dianella longifolia (Blueberry Lily)*	0.2	40		N
Shrub (SG)	*Leucopogon lanceolatus*	0.2	3		N
Grass & grasslike (GG)	*Lomandra filiformis subsp. filiformis*	0.1	10		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	20		N
	Hypochaeris radicata (Catsear)	0.1	10		E
Forb (FG)	*Stylidium graminifolium (Grass Triggerplant)*	0.1	30		N
Shrub (SG)	*Acacia spp. (Wattle)*	0.1	2		N
Shrub (SG)	*Platysace ericoides*	0.1	30		N
Forb (FG)	*Poranthera microphylla (Small Poranthera)*	0.1	20		N
Forb (FG)	*Goodenia hederacea subsp. hederacea*	0.1	40		N
	Anthoxanthum odoratum (Sweet Vernal Grass)	0.1	10		E
Grass & grasslike (GG)	*Lomandra filiformis subsp. coriacea (Wattle Matt-rush)*	0.1	10		N
Forb (FG)	*Chiloglottis spp.*	0.1	5		N
Shrub (SG)	*Conospermum taxifolium (Variable Smoke-bush)*	0.1	3		N
Tree (TG)	*Eucalyptus dives (Broad-leaved Peppermint)*	2	5		N

Appendix B
Project-specific consultation

EMM
creating opportunities

7 December 2023

Liz Mazzer
A/Senior Team Leader
Biodiversity, Conservation and Sciences Directorate
Sent via email:
liz.mazzer@environment.nsw.gov.au

Project Name: Lake Lyell PHESS EIS - Brush-tailed Phascogale - survey requirement clarification memorandum
Project Number: E221111

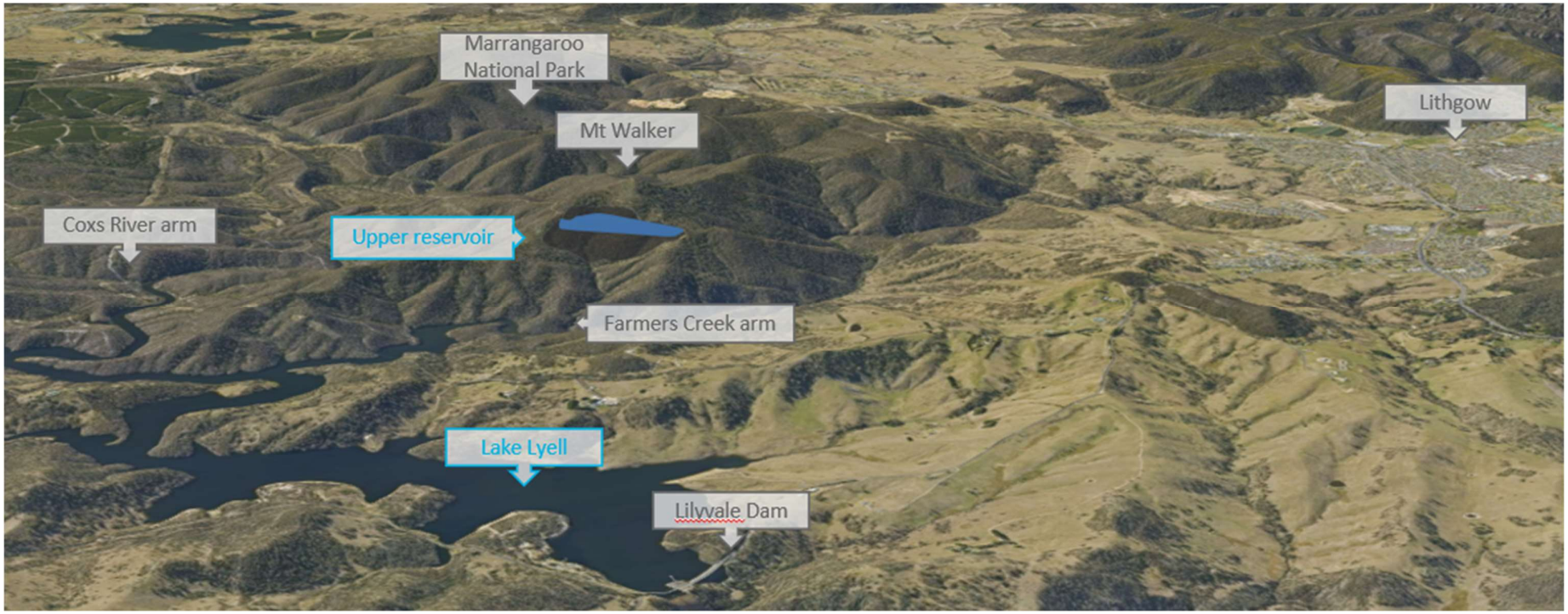
1 Introduction

An initial meeting and discussion was held between the Lake Lyell PHES EIS project team and Liz Mazzer of the Biodiversity, Conservation and Sciences Directorate (BCS) on 23 October 2023. During the meeting, clarification of survey requirements for some species was discussed and EMM agreed to provide a series of memos for review by the relevant BCS accountable officer to assist clarification and responses for individual species.

To ensure the project meets expected survey requirements and adequately informs the preparation of the Biodiversity Development Assessment Report, this memorandum seeks to clarify survey requirements for Brush-tailed Phascogale (*Phascogale tapoatafa*).

1.1 Selected information relevant to survey requirements

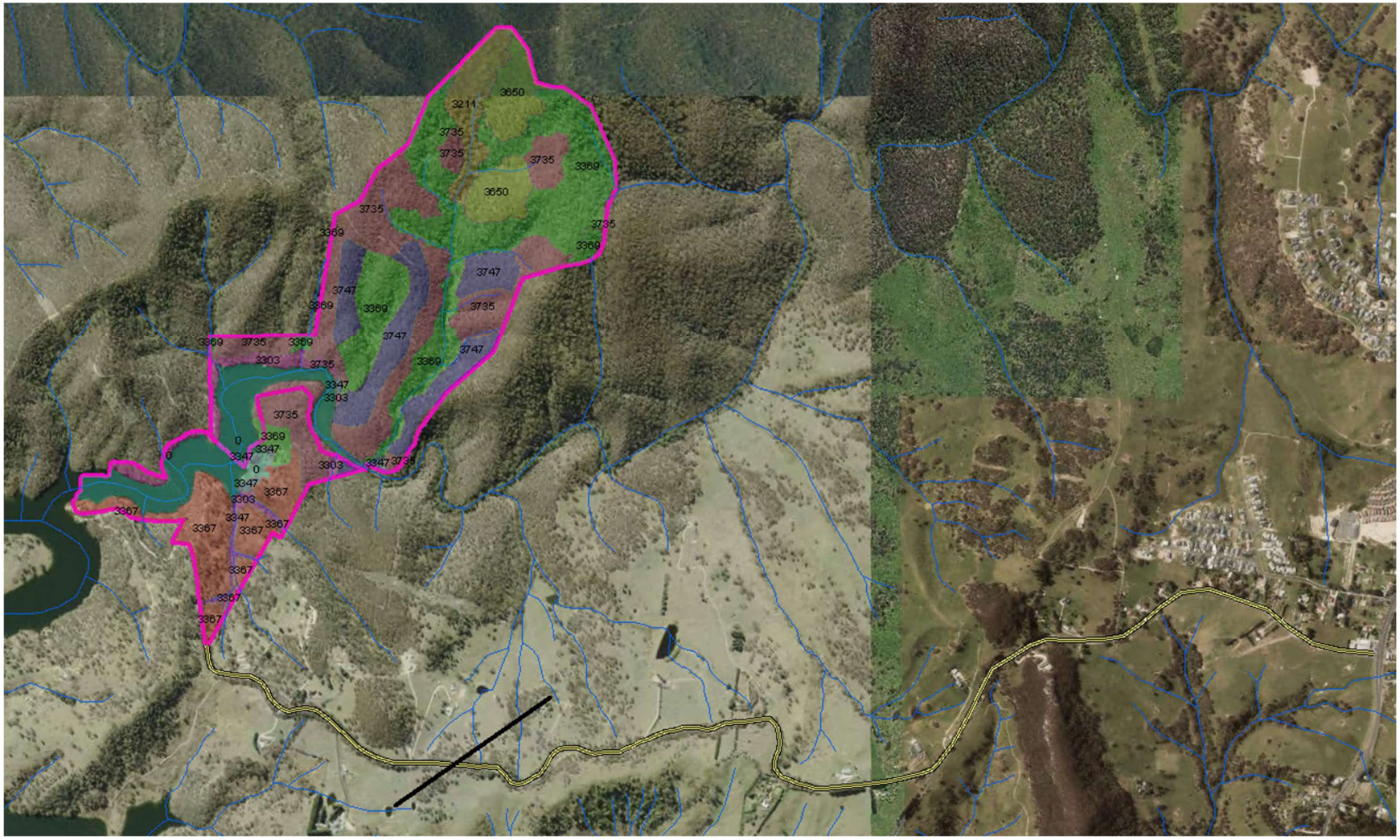
1.1.1 Site location



NB: the site is almost entirely within the Hill End IBRA Subregion with part of the main access route within the Bathurst IBRA subregion. PCTs have not been confirmed for the access route but only relatively small amount of clearing is likely to be required there along the edge of the existing road.

1.1.2 Draft PCT mapping

8 PCTs mapped at present but some refinement of mapping is still required; 3211, 3303, 3347, 3367, 3369, 3650, 3735, 3747



1.1.3 Threatened Biodiversity Data Collection

"Low population densities, large home range size, annual male die-off and fluctuating local abundance make Brush-tailed Phascogales difficult to detect reliably. It may be more appropriate to seek an expert report to determine presence or absence. Survey Dec – Jun, noting that Dec – Feb is the main juvenile dispersal period and May – Jun is the peak mating season, when males are most likely to be detected (particularly towards the end of the season, as deceased individuals).

Survey must be undertaken using baited cameras. The bait type used must remain as an effective attractant until replaced. Honeyed oat balls will need to be replaced daily. Other effective baiting methods include using a baited canister with small holes and capped at either end, to limit bait theft by other species, or honey-water, sprayed very liberally in front of each camera. The baited canister and honey-water will require less frequent replenishment of the bait compared to a bait ball. Cameras should be set at head height, or above, facing the branch or tree trunk where a honey-based bait has been placed. Cameras must remain in place for a minimum of 4 weeks with cameras checked and baits replaced after 2 weeks. A minimum of 4 cameras, independent of the size of the subject land, must be used for sites up to 1 ha, then an additional 2 cameras for every ha of suitable habitat thereafter. Cameras must be evenly spaced across the site. Where potential habitat is disconnected by gaps of 50 m or more, each habitat patch should have a minimum of 4 cameras for the first ha, and 2 cameras for every ha thereafter. Malfunctioning cameras must be replaced and additional cameras and time must be invested to address the lost survey effort. That is, at least 22 working, baited, evenly spaced camera traps are required for the first 10 ha of suitable habitat."

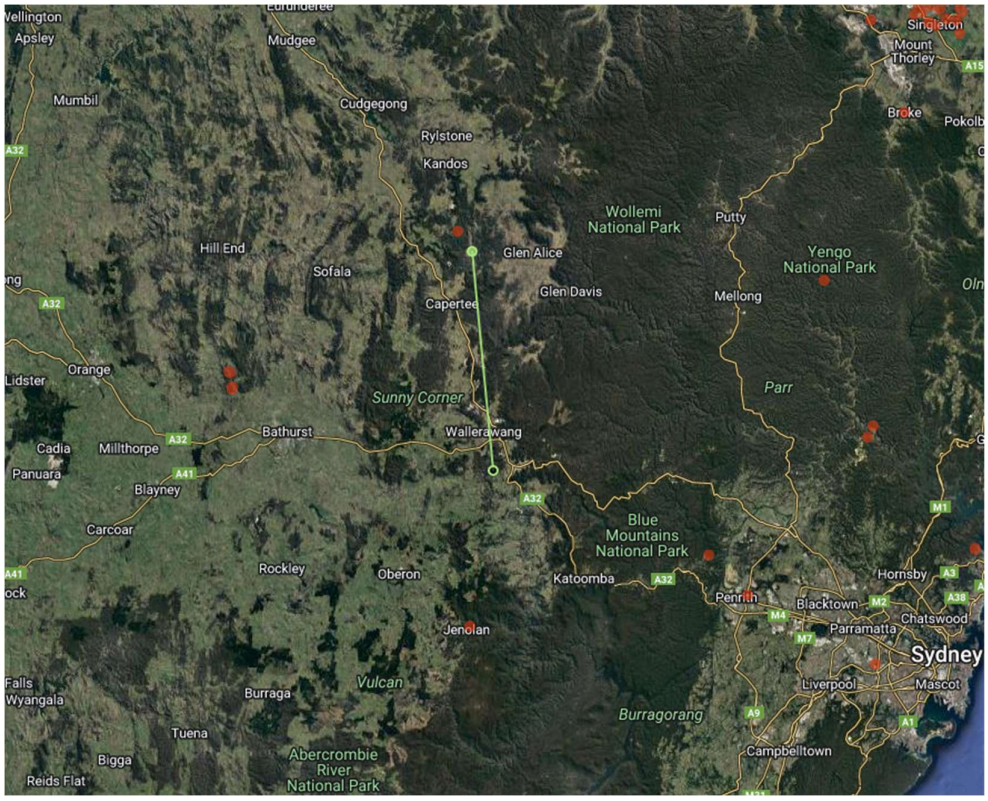
"Where the subject land is >10ha, contact the BOS Helpdesk providing a camera survey approach for review by species experts. Include a map (or maps) of the subject land showing:

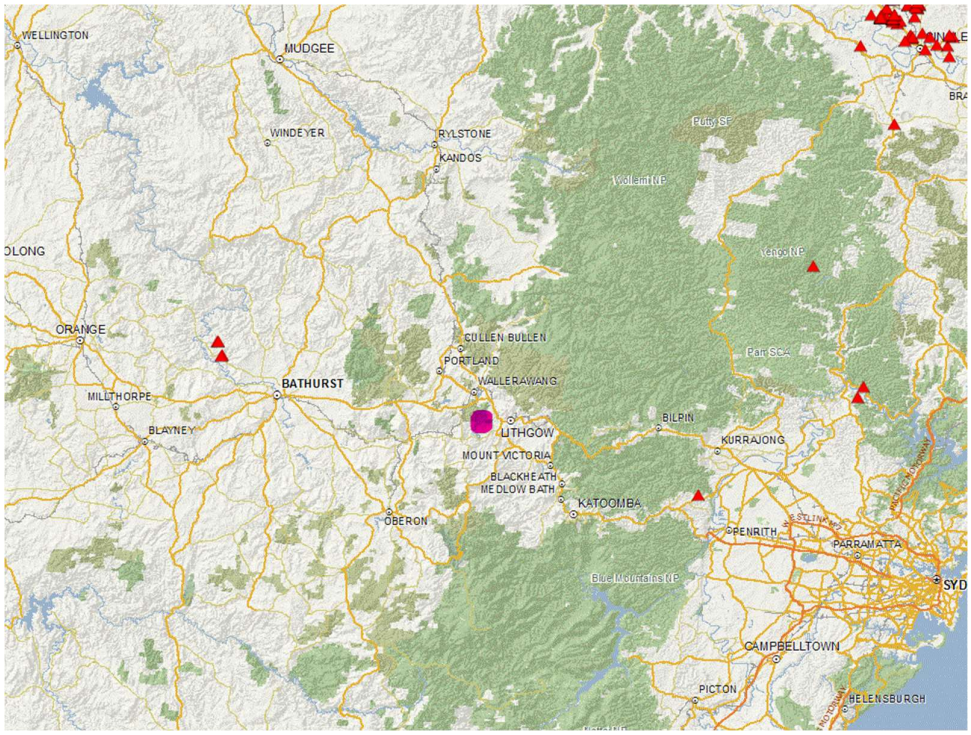
- suggested camera placements,
- PCTs within the subject land, including each vegetation zone and its condition, and
- records of the species within, and within 50 km of, the subject land.

Species polygon: If detected or presence is assumed (impact site only) the species polygon is drawn around the outer-edge of the PCTs that the species is associated, as defined in the TBDC."

1.1.4 Species known distribution

Records of the species within 50 km of the site are shown in screenshots from the Atlas of Living Australia and the Bionet Atlas of NSW Wildlife. The green bar in the first image (ALA map) represents a 50 km distance extending north from the middle of the site, which is south of Wallerawang. On the second image (Bionet Atlas) the site is represented by a purple spot.





1.2 Field survey findings to date

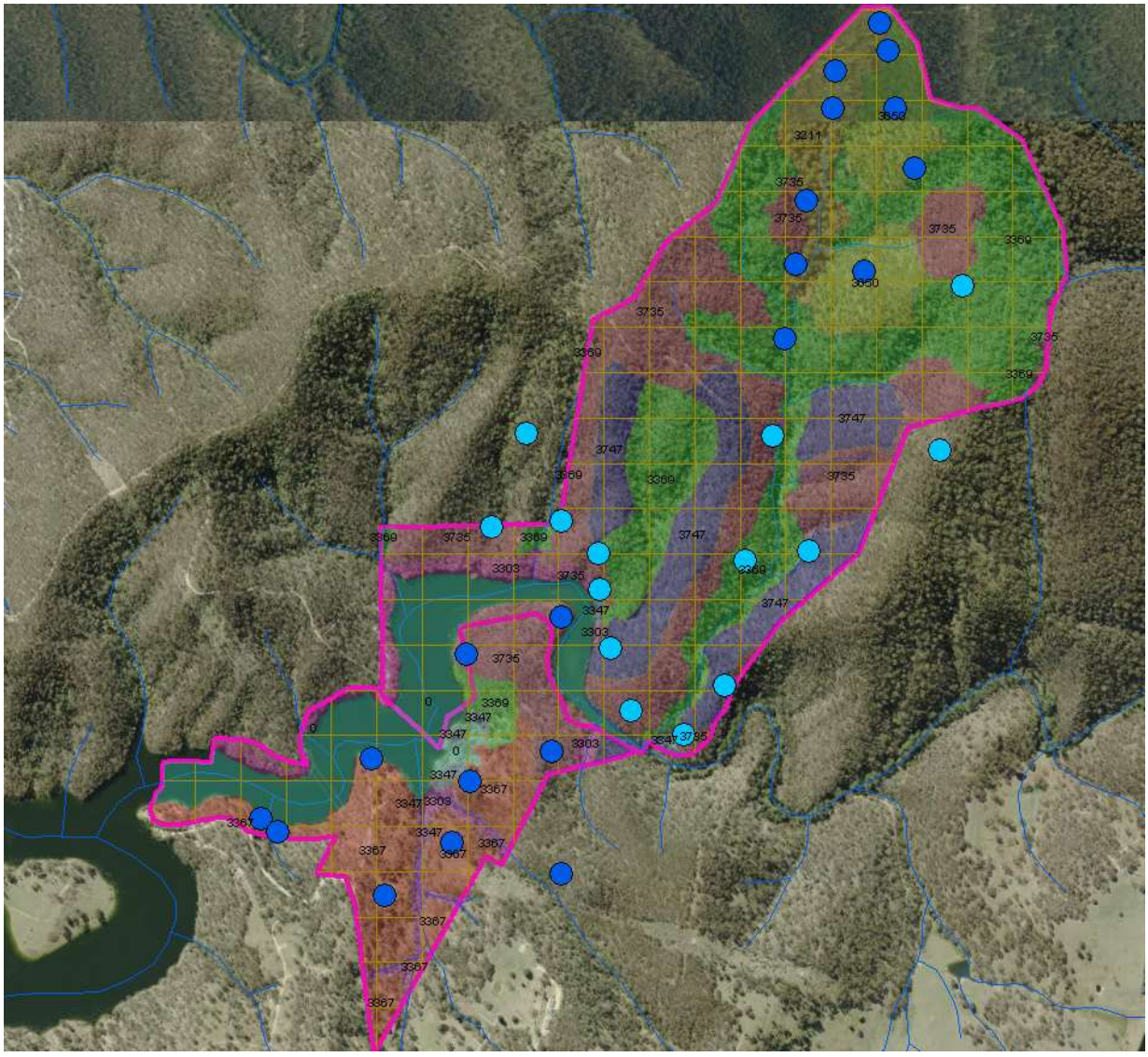
Surveys conducted to date are illustrated below on a draft map of PCTs with a 100 m grid.

Note that the most areas of the site are in similar condition and only relatively small areas are likely be split out into lower condition vegetation zones. All zones containing trees (excluding small saplings) will be surveyed.

20 cameras (dark blue spots in screenshot below) set out with honeyed oat balls as described in the TBDC for 4 weeks during the species' survey period, rebaited after two weeks.

14 cameras (light blue spots in screenshot below) set out with honeyed oat balls as described in the TBDC for 2 weeks during the species' survey period.

No Brush-tailed Phascogale recorded to date though all cameras detected at least one native arboreal mammal species. Native arboreal mammal species detected on cameras to date include Common Brush-tailed Possum, Common Ringtail Possum, Krefft's Glider, Feathertail Glider and Antechinus species.



1.3 Comments and questions regarding survey requirements

The study area contains more than 130 ha of suitable habitat. At the rate of two cameras per hectare that is suggested for smaller study areas, more than 260 camera survey locations would be required.

Given the size of the study area, would a reduced density of two cameras per three hectares, spread roughly evenly across the site and representing all PCTs in proportion to their area, be acceptable?

Thank you for your assistance. If you would like to discuss the contents of this memo further, please feel free to contact me on 0412 350 481.

Yours sincerely



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11 January 2024

Liz Mazzer
A/Senior Team Leader
Biodiversity, Conservation and Sciences Directorate
Sent via email:
liz.mazzer@environment.nsw.gov.au

Project Name: Lake Lyell PHES EIS - Gang-gang Cockatoo- survey requirement clarification memorandum
Project Number: E221111

1 Introduction

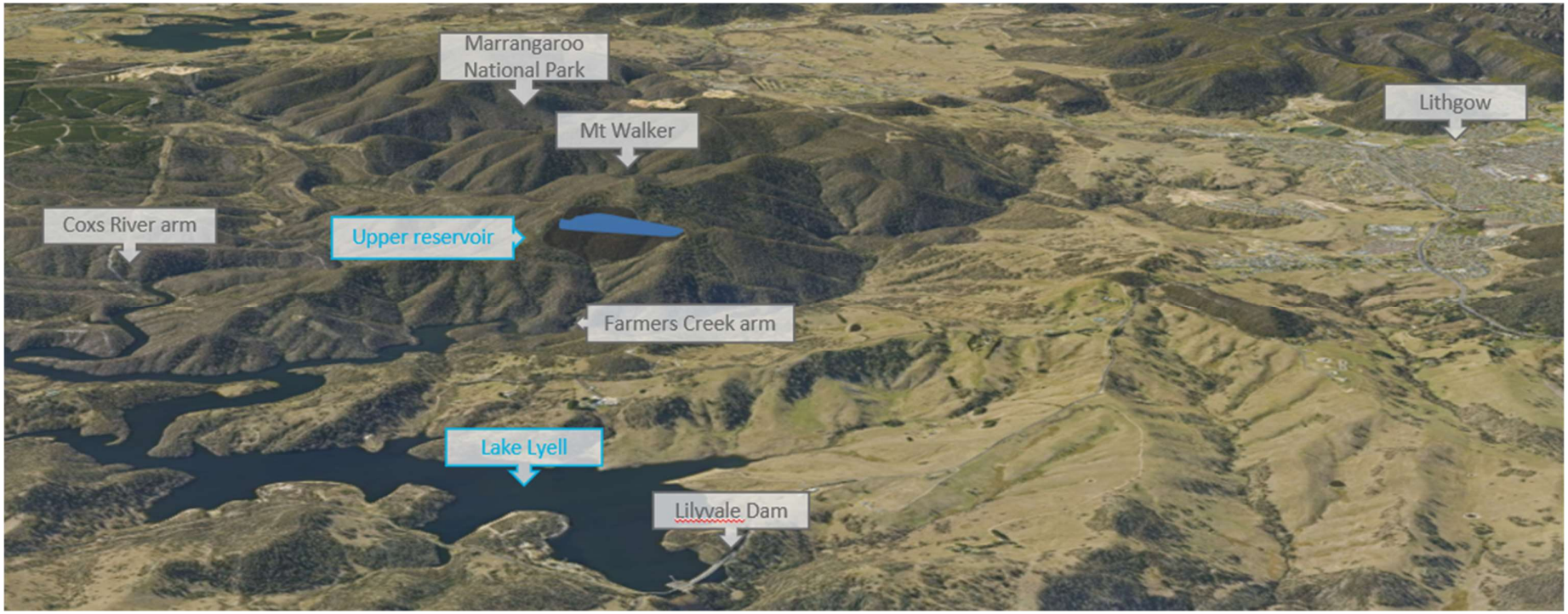
An initial meeting and discussion was held between the Lake Lyell PHES EIS project team and Liz Mazzer of the Biodiversity, Conservation and Sciences Directorate (BCS) on 23 October 2023. During the meeting, clarification of survey requirements for some species was discussed and EMM agreed to provide a series of memos for review by the relevant BCS accountable officer to assist clarification and responses for individual species.

To ensure the project meets expected survey requirements and adequately informs the preparation of the Biodiversity Development Assessment Report, this memorandum seeks to clarify survey requirements for Gang-gang Cockatoo (*Callocephalon fimbriatum*).

Information presented herein is based on survey effort to date and/or planned for the species, and with reference to the current guidelines.

1.1 Selected information relevant to survey requirements

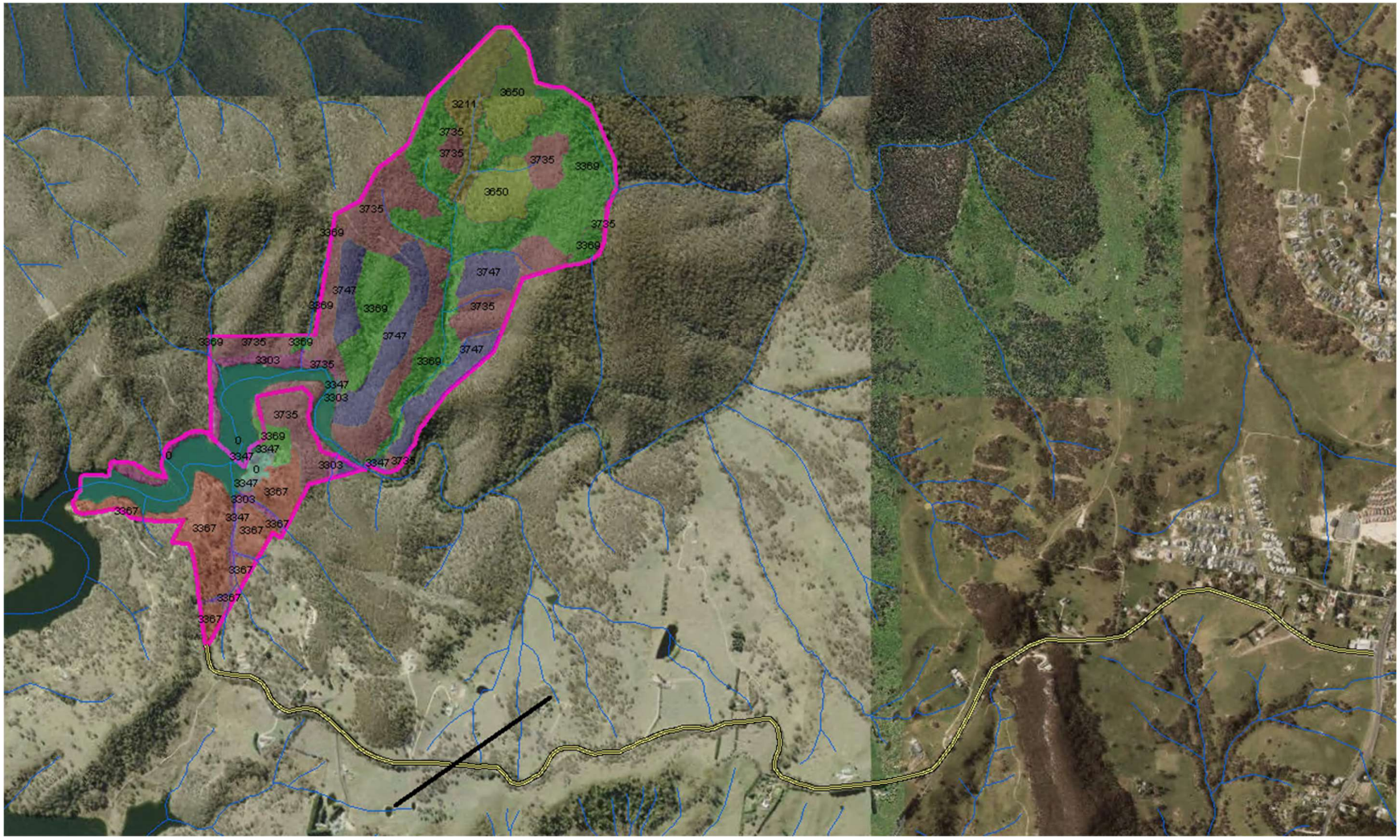
1.1.1 Site location



NB: the site is almost entirely within the Hill End IBRA Subregion with part of the main access route within the Bathurst IBRA subregion. PCTs have not been confirmed for the access route but only relatively small amount of clearing is likely to be required there along the edge of the existing road.

1.1.2 Draft PCT mapping

8 PCTs are mapped at present but some refinement of mapping is still required; 3211, 3303, 3347, 3367, 3369, 3650, 3735, 3747



1.1.3 Habitat Constraint

"Eucalypt tree species with hollows at least 3 m above the ground and with hollow diameter of 7 cm or larger"

1.1.4 TBDC Survey Comments

"1. Assessors should look for SIGNS OF BREEDING on site as follows; (a) lone adult males identified during the breeding season (October to January); or (b) an occupied nest. If breeding is presumed present, progress to Step 3.

2. Where signs of breeding on site are present, POTENTIAL NEST TREES should be identified. Potential nest trees are forest and woodland eucalypts containing hollows that are; (i) at least 3 m above the ground and (ii) with hollow diameter of 7 cm or larger.

3. Where potential nest trees are identified on site, monitor for this species during the breeding season (October to January) to confirm the presence of any ACTUAL NEST TREES on site. DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

4. If actual nest trees are confirmed on site, then the species polygons are to be drawn around those actual nest trees (i.e. trees that birds of the species are known to have used for nesting). The species polygons should be circular in shape and must include a buffer RADIUS of 200 m around each actual nest tree. The purpose of the buffer is to identify the essential area for breeding and minimise disturbance/avoid clearing for a development application, or conserve and improve habitat for a biodiversity stewardship agreement. The shape of the buffer can be modified where evidence provided in the Biodiversity Assessment Report indicates an alternative shape would better meet the species needs in the context of the assessment site. For example, extant vegetation is linear, and the nest tree is already located near the edge of the wooded area."

1.1.5 EPBC Act Conservation Advice

"Preferred hollows generally have an entrance height of 21.3 cm (minimum entrance height 12 cm) and an average entrance width of 13.1 cm (range 9–24 cm; Davey & Mulvaney 2020). The hollow chambers are generally around 20 cm in floor diameter, around 50.5 cm deep (range 22 - 90 cm) and occur around 7.5 m (range 5–9.4 m) above the ground (Davey & Mulvaney 2020)."

"Gang-gang pairs utilise multiple nest trees over different years…"

"Only about half of known nest trees are utilised each year (Davey & Mulvaney 2020), but individuals may use the same roosting and nesting site for multiple years (Higgins 1999)."

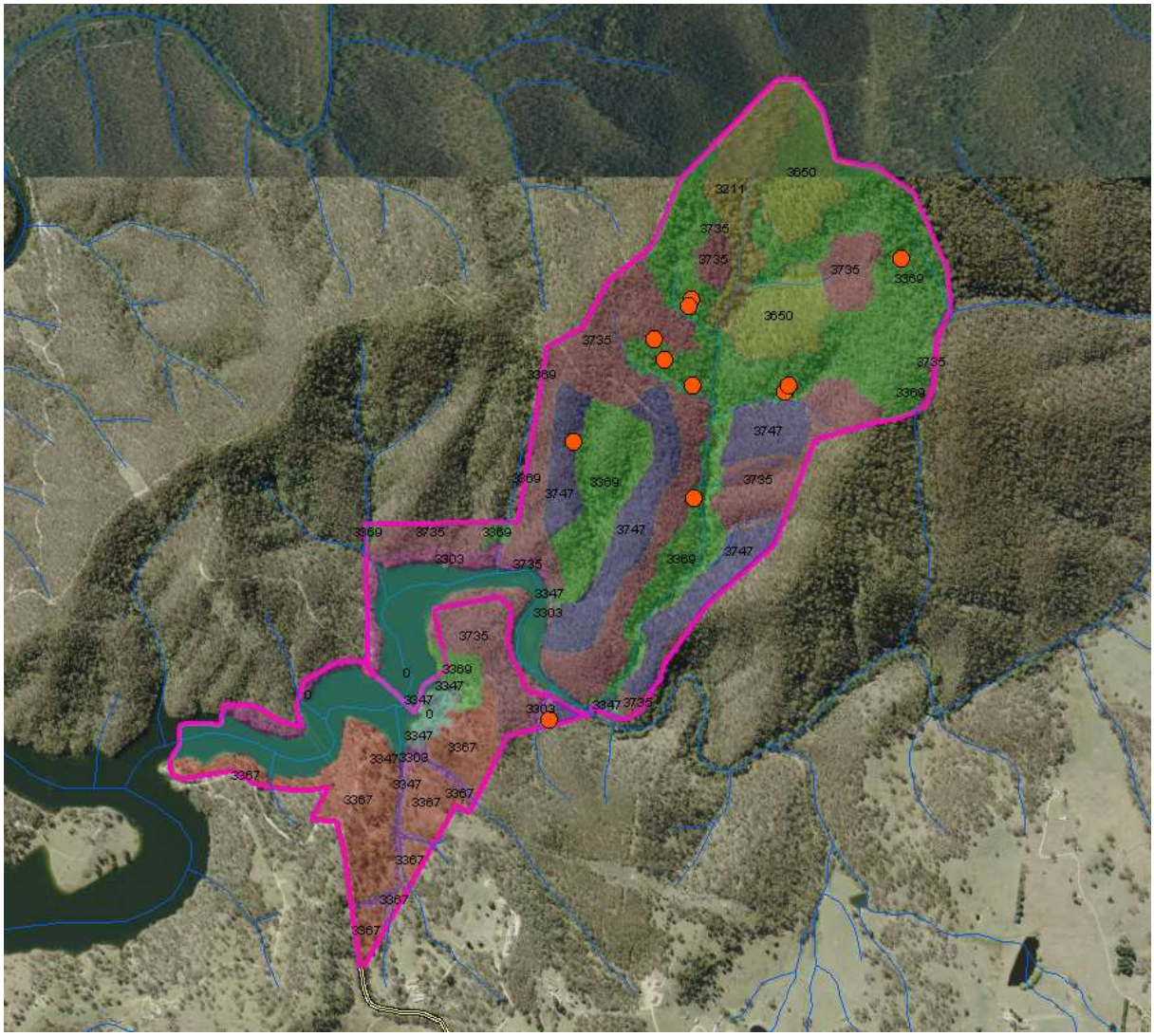
"This means that birds may not utilise areas that constitute habitat critical to the survival in any one given year. This pattern of habitat use means that in order to assess the relative importance of a local area or region for Gang-gang Cockatoos, species occurrence data must span a number of seasons and years, so as to capture the seasonal and inter-annual movements of the species."

1.2 Field survey findings to date

To date, Gang-gang Cockatoos have been observed showing signs of breeding activity (pairs inspecting and/or renovating hollows) in 12 locations, all but one of which are in the taller forest at high elevation north of Lake Lyell (see red dots in the image below). The birds were typically heard calling and traced to their apparent nesting locations in late September, November and December during threatened plant and habitat assessment surveys and during targeted searches.

The species has been recorded flying over and foraging in other parts of the site, mainly to the north of Farmers Creek / Lake Lyell.

There is a high density of trees containing potential nest hollows over a large proportion of the site but some areas to the south-west of the lake appear to have been partially cleared in the past and have much lower hollow densities.



1.3 Questions regarding survey requirements

The following outlines EMM request for clarification regarding species survey requirements:

1. Given the density of potential nesting hollows on the site, can we use an area-based survey approach to detect breeding birds?

2. Would the following approach be supported?

    a) Establish a 100 m grid across the area containing potential nesting trees

    b) An observer spending approximately 15-20 minutes in each 100 m x 100 m grid cell during the species' breeding season, searching for and recording suitable nesting hollows and Gang-gang Cockatoo breeding activity.

3. Would you have any other suggestions for a survey approach?

4. Is observation of a pair of birds inspecting or renovating a tree hollow sufficient evidence to conclude that the hollow constitutes an actual nest site and is there anything to be gained from revisiting these locations to verify actual nesting?

Thank you for your assistance. If you would like to discuss the contents of this memo further, please feel free to contact me on 0412 350 481.

Yours sincerely



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7 December 2023

Liz Mazzer
A/Senior Team Leader
Biodiversity, Conservation and Sciences Directorate
Sent via email:
liz.mazzer@environment.nsw.gov.au

Project Name: Lake Lyell PHES EIS - Glossy Black Cockatoo- survey requirement clarification memorandum
Project Number: E221111

1 Introduction

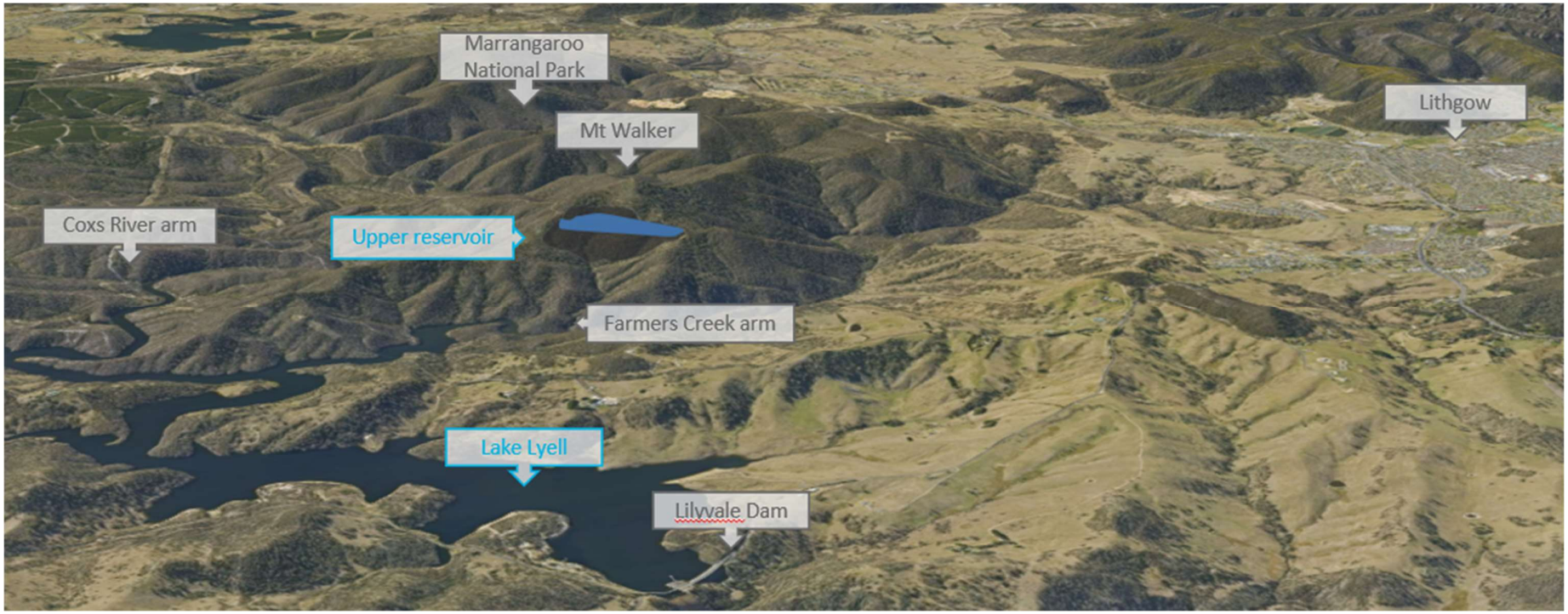
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To ensure the project meets expected survey requirements and adequately informs the preparation of the Biodiversity Development Assessment Report, this memorandum seeks to clarify survey requirements for Glossy Black Cockatoo (*Calyptorhynchus funereus*).

Information presented herein is based on survey effort to date and/or planned for the species, and with reference to the current guidelines.

1.1 Selected information relevant to survey requirements

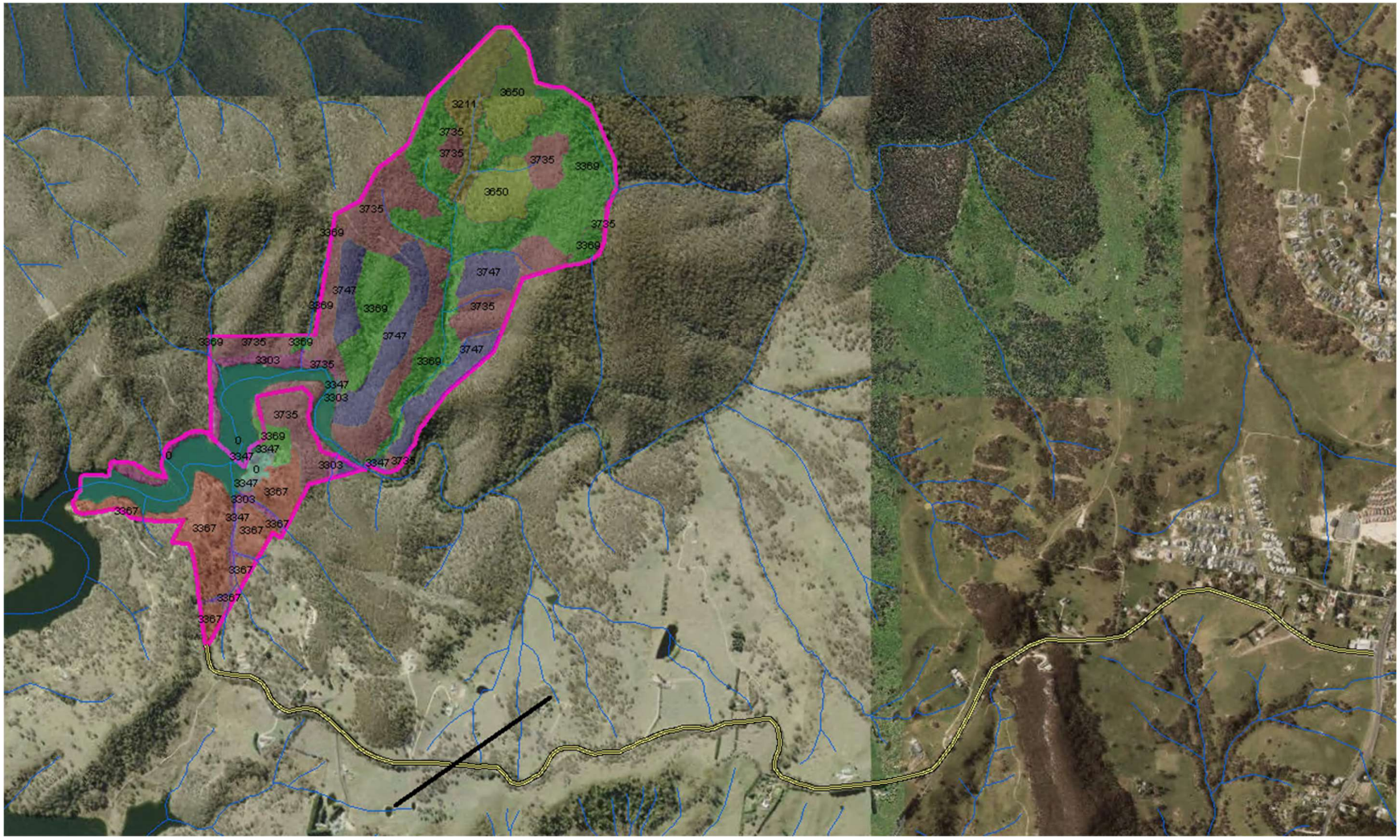
1.1.1 Site location



NB: the site is almost entirely within the Hill End IBRA Subregion with part of the main access route within the Bathurst IBRA subregion. PCTs have not been confirmed for the access route but only relatively small amount of clearing is likely to be required there along the edge of the existing road.

1.1.2 Draft PCT mapping

8 PCTs are mapped at present but some refinement of mapping is still required; 3211, 3303, 3347, 3367, 3369, 3650, 3735, 3747



1.1.3 Habitat Constraint - Species credit

"Living or dead tree with hollows greater than 15cm diameter and greater than 8m above ground"

1.1.4 Habitat Constraint Ecosystem credit

"Presence of Allocasuarina and Casuarina species"

1.1.5 TBDC Survey Comments

"1. 1. Assessors should look for SIGNS OF BREEDING on site as follows; (a) begging birds of any age or sex; or (b) lone adult males identified during the breeding season (April to August); or (c) an occupied nest.

2. Where signs of breeding on site are present, POTENTIAL NEST TREES should be identified. Potential nest trees contain hollows that are; (i) at least 8 m above the ground; and (ii) in stems with a diameter of at least 30 cm; and (iii) hollow diameter is at least 15 cm; and (iv) stem angle is at least 45 degrees, and may be near-vertical or vertical.

3. Where potential nest trees are identified on site, monitor for this species during the breeding season (Apr – Aug) to confirm the presence of any ACTUAL NEST TREES on site. DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

4. If actual nest trees are confirmed on site, then the species polygons are to be drawn around those actual nest trees (i.e. trees that birds of the species are known to have used for nesting). The species polygons should be circular in shape and must include a buffer RADIUS of 200 m around each actual nest tree. The purpose of the buffer is to identify the essential area for breeding and minimise disturbance/avoid clearing for a development application, or conserve and improve habitat for a biodiversity stewardship agreement. The shape of the buffer can be modified where evidence provided in the Biodiversity Assessment Report indicates an alternative shape would better meet the species needs in the context of the assessment site. For example, subject land under assessment is linear, and the nest tree is already located near the edge of the wooded area."

1.1.6 NSW TSSC Review of Current information in NSW (2008)

"The Glossy Black-Cockatoo inhabits eucalypt open forest and woodland with hollow-bearing trees and a midstorey of sheoaks. It nests in tree hollows, and forages exclusively in sheoak species."

"Glossy Black-Cockatoos breed semi-colonially and pairs defend only the immediate area of the nest hollow, ranging widely to forage."

1.1.7 EPBC Act Conservation Advice

"South-eastern glossy black cockatoos feed almost exclusively on the seeds of sheoaks (Allocasuarina spp. and Casuarina spp.), usually relying on one or two species within a region (Higgins 1999). This preference may explain the patchy distribution of the subspecies in parts of its range. Alongside the already narrow dietary requirement, the birds also show strong preference to individual feed trees and will not feed on many other proximate trees of the same tree species."

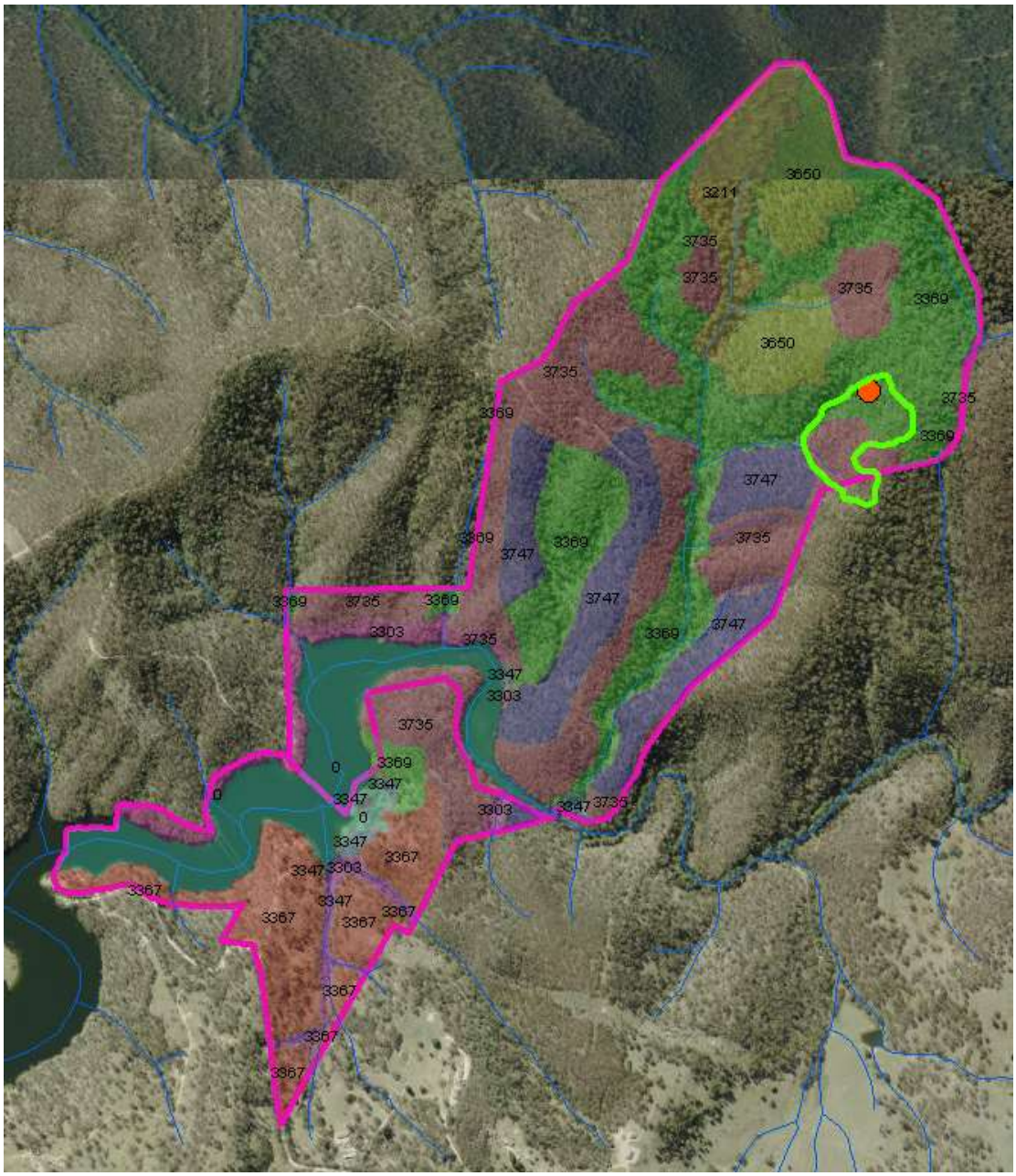
"Further research is needed to expand our knowledge on the nesting habits and habitat of the subspecies (i.e., nest tree species used in other regions of the subspecies' range). Additionally, the Kangaroo Island subspecies (C. l. halmaturinus), may fly up to 14 km between feeding and nesting areas without adversely affecting breeding success, and most nests are within 1 km of their primary feed tree species, and 200 m of permanent water (Mooney & Pedler 2005)."

1.2 Field survey effort and findings to date

A pair of Glossy Black Cockatoos (red dot in the image below) was recorded foraging in an area containing a in a substantial, high-density patch of Black She-oak (*Allocasuarina littoralis*) mid-storey in the north-east of the site (green polygon)during the species' breeding season . Abundant evidence of feeding (chewed cones) was observed in this patch of habitat. Several other small (< 5 plants) patches of Black She-oak occur on the site but no evidence of feeding was observed in these locations and Allocasuarina spp. and Casuarina spp. are generally uncommon elsewhere within and adjacent to the site.

To date, no signs of Glossy Black Cockatoo breeding activity been observed.

There is a relatively high density of trees containing potential nest hollows over a large proportion of the site but hollow density is lower to the south-west of the site, south of the lake where there is evidence of historical tree clearing.



1.3 Questions regarding survey requirements

The following outlines EMM request for clarification regarding species survey requirements:

1. Given the density of potential nesting hollows on the site, can we use an area-based survey approach to detect breeding birds?

2. Would the following approach be supported?

    a) Establish a 100 m grid across the area containing potential nesting trees

    b) An observer spending approximately 15-20 minutes in each 100 m x 100 m grid cell during the species' breeding season, searching for and recording suitable nesting hollows and Gang-gang Cockatoo breeding activity.

3. Would you have any other suggestions for a survey approach?

4. Is observation of a pair of birds inspecting or renovating a tree hollow sufficient evidence to conclude that the hollow constitutes an actual nest site and is there anything to be gained from revisiting any such locations to verify actual nesting?

Thank you for your assistance. If you would like to discuss the contents of this memo further, please feel free to contact me on 0412 350 481.

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7 December 2023

Liz Mazzer
A/Senior Team Leader
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Sent via email:
liz.mazzer@environment.nsw.gov.au

Project Name: Lake Lyell PHES EIS - Owls- survey requirement clarification memorandum
Project Number: E221111

1 Introduction

An initial meeting and discussion was held between the Lake Lyell PHES EIS project team and Liz Mazzer of the Biodiversity, Conservation and Sciences Directorate (BCS) on 23 October 2023. During the meeting, clarification of survey requirements for some species was discussed and EMM agreed to provide a series of memos for review by the relevant BCS accountable officer to assist clarification and responses for individual species.

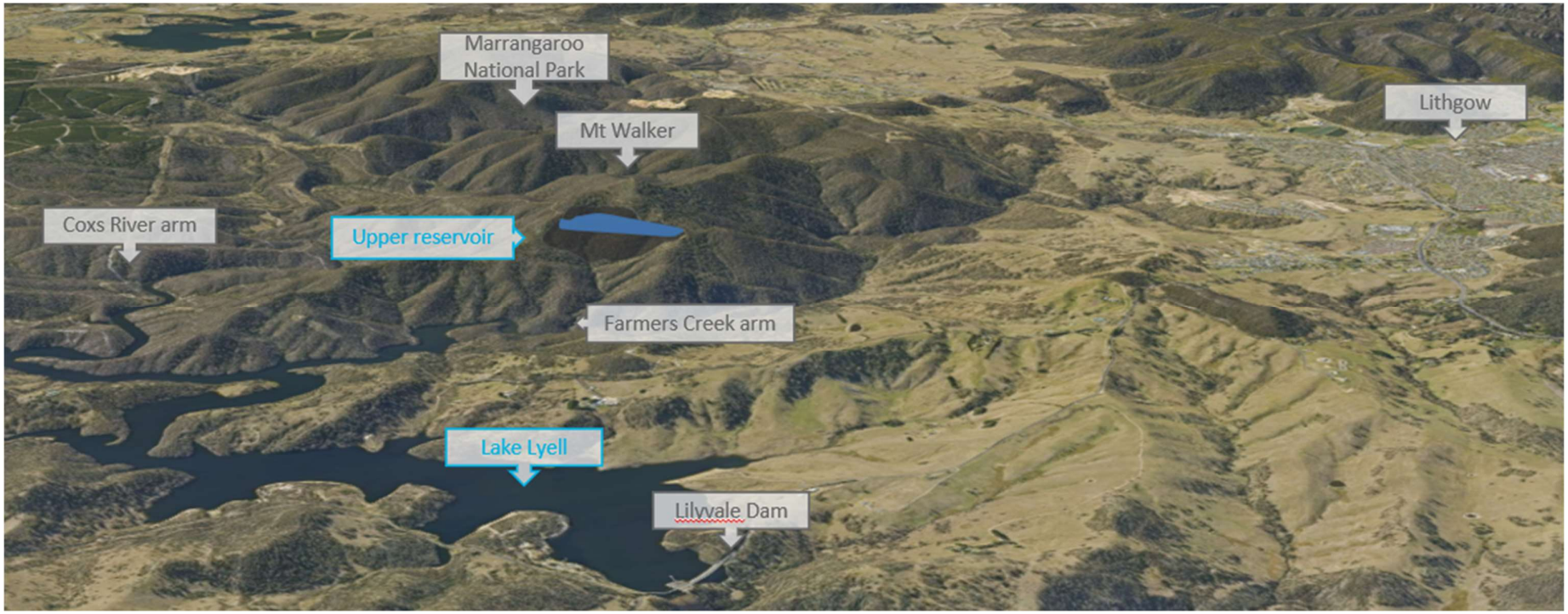
To ensure the project meets expected survey requirements and adequately informs the preparation of the Biodiversity Development Assessment Report, this memorandum seeks to clarify survey requirements for the following owl species:

- Powerful Owl (*Ninox strenua*
- Sooty owl (*Tyto tenebricosa*)
- Barking Owl (*Ninox connivens*)
- Masked Owl (*Tyto novaehollandiae*)

Information presented herein is based on survey effort to date and/or planned for the species, and with reference to the current guidelines.

1.1 Selected information relevant to survey requirements

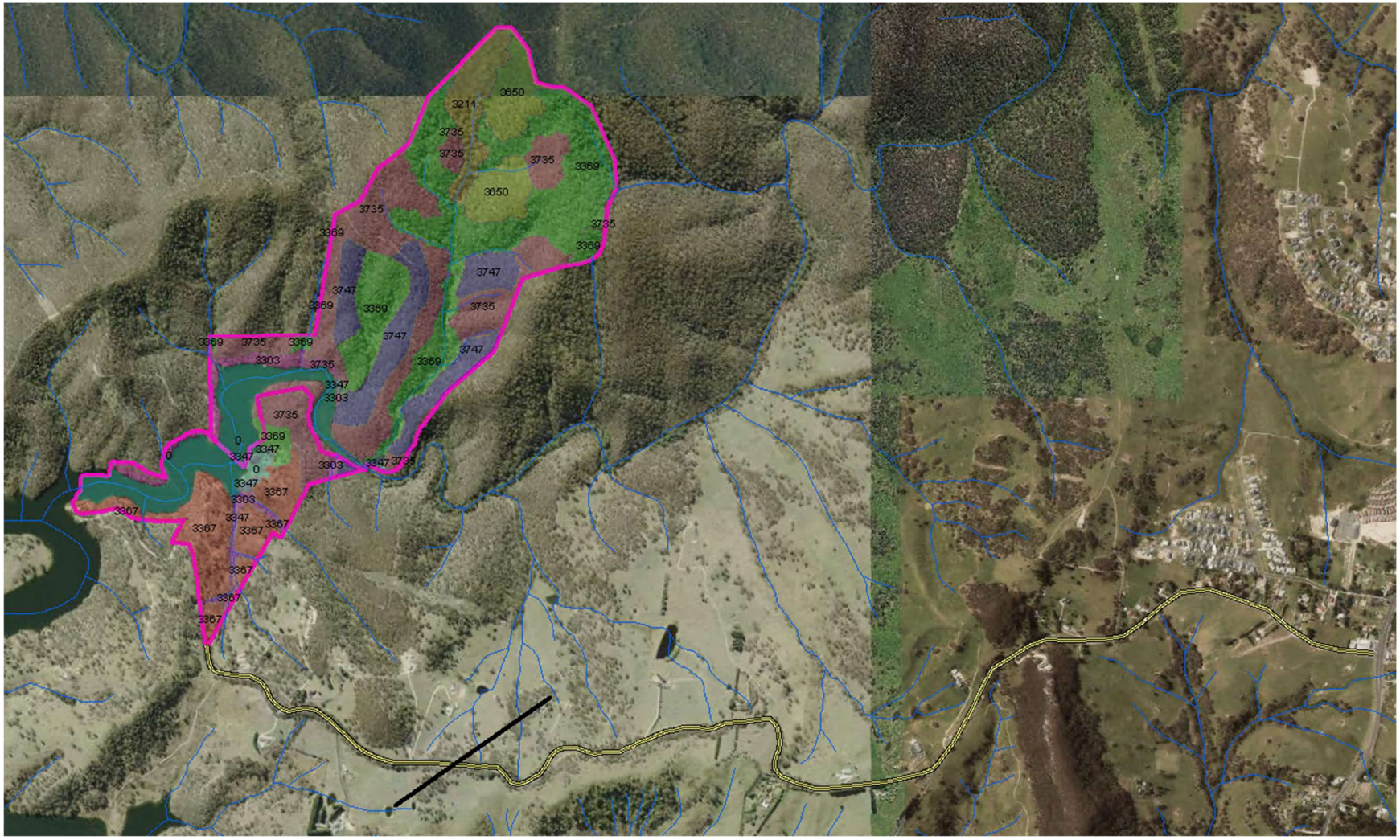
1.1.1 Site location



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1.1.2 Draft PCT mapping

8 PCTs are mapped at present but some refinement of mapping is still required; 3211, 3303, 3347, 3367, 3369, 3650, 3735, 3747



1.1.3 Habitat Constraint - Species credit

i Powerful Owl, Masked Owl and Sooty Owl

"Living or dead trees with hollows greater than 20cm diameter (and greater than 4 m above the ground for Barking Owl).

"Caves or clifflines/ledges" (Sooty Owl only).

1.1.4 TBDC Survey Comments

i Powerful Owl and Barking Owl

"1. Look for SIGNS OF BREEDING on site as follows; suitable habitat AND (a) presence of male and female OR (b) calling to each other (duetting) OR (c) find nest. "

Powerful Owl: "Note that this species does not respond as well to call-play-back and could require stagwatching and other evidence of nesting."

2. Where signs of breeding on site are present, POTENTIAL NEST TREES should be identified. Potential nest trees are living or dead trees with hollows greater than 20 cm diameter (and greater than 4 m above the ground for Barking Owl).

3. Where potential nest trees are identified on site, night monitoring at the identified potential nest locations for a minimum of 2 nights should be undertaken to detect the presence of any owl of this species using a potential nest tree or demonstrating behaviour focussed on a potential nest tree (e.g. investigating the hollow or roosting within 10 m). DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake species surveys using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

4. If monitoring of potential nest trees detects this owl species using, or demonstrating behaviour focussed on the trees (e.g. investigation of the hollow or roosting within 10 m) on site, the species polygons should be drawn around those trees (i.e the identified potential nest trees where any owl of this species is observed using, or focussing behaviour around the tree). The species polygons should be circular in shape and must include a buffer RADIUS of 100 m around each tree. The purpose of the buffer is to minimise disturbance/avoid clearing, for a development application, or to conserve and improve habitat, for a biodiversity stewardship agreement, within the area essential for breeding. This includes habitat suitable for male roosts, feeding/grooming perches and fledgling requirements. It does not account for foraging habitat. The shape of the buffer can be modified where evidence provided in the Biodiversity Assessment Report indicates an alternative shape would better meet the species needs in the context of the assessment site. For example, extant vegetation is linear, and the nest tree is already located near the edge of the wooded area."

ii Masked Owl and Sooty Owl

"Where a breeding site has been identified in accordance with the BAM the species polygon should be established by providing a circular buffer with a 100m radius around the nest tree. The purpose of the buffer is to minimise disturbance/avoid clearing, for a development application, or to conserve and improve habitat, for a biodiversity stewardship agreement, within the area essential for breeding. This includes habitat suitable for male roosts, feeding/grooming perches and fledgling requirements. It does not account for foraging habitat. The shape of the buffer can be modified where evidence provided in the Biodiversity Assessment Report indicates an alternative shape would better meet the species needs in the context of the assessment site. For example, extant vegetation is linear and the nest tree is already located near the edge of the wooded area. DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a

species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements)."

1.1.5 Recovery Plan for the Large Forest Owls

"…. for Powerful Owls and Sooty Owls there is long-term population stability with high adult survival and strong fidelity of breeding adults to territories. Confidence in this assessment is lower for Masked Owls because they are less abundant and more difficult to survey."

"… source and sink populations exist, in terms of sedentary breeding adults in high-quality habitat, juvenile dispersal to low-quality habitat, and persistence of some non-breeding individuals in low-quality habitat lacking nest sites or sufficient prey densities for breeding."

i Powerful Owl

"Nesting: old hollow eucalypts in unlogged, unburnt gullies and lower slopes within 100 m of streams or minor drainage lines, with hollows greater than 45 cm diameter and greater than 100 cm deep; surrounded by canopy trees and subcanopy or understorey trees or tall shrubs.

Hollow entrances are greater than 6 m above ground, commonly more than 20 m where the forest permits, in trees of at least 80 cm diameter at breast height. A pair is generally faithful to a traditional nesting hollow, but also sometimes uses alternative hollows in the nesting gully."

ii Sooty Owl

"Nesting: old hollow trees, eucalypt or rainforest species, usually live but stags are occasionally used, in unlogged, unburnt gullies and lower slopes within 100 m of streams, with hollows greater than 40 cm wide and greater than 100 cm deep; surrounded by canopy trees. Also nests in caves. Hollow entrances are at least 16 m above ground, in trees of at least 120 cm diameter at breast height. The pair is faithful to a traditional nesting hollow. (Data from Hollands 1991, Kavanagh 1997, Kavanagh 2002b)."

1.2 Findings to date

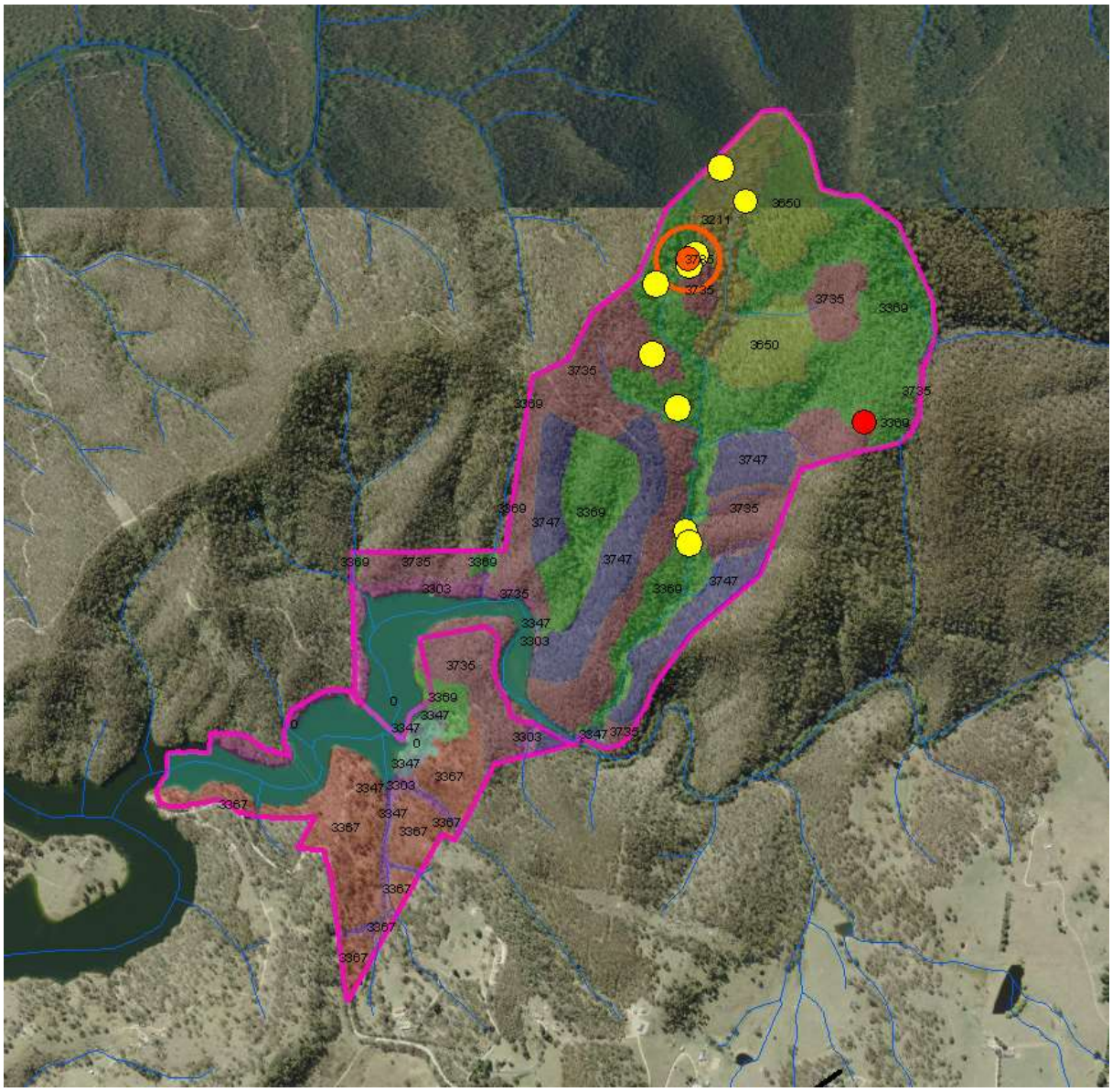
Call playback and songmeter data analysis conducted to date has not revealed any evidence of Masked Owls or Barking Owls inhabiting the study area.

There is a relatively high density of trees containing potential nest hollows possibly suitable for threatened owls over a large proportion of the site, but hollow density is generally lower to the south of Lake Lyell, particularly in the south-west due to the smaller size of trees and historical tree clearing.

A pair of Powerful Owls and at least one Sooty Owl have been recorded in the study area.

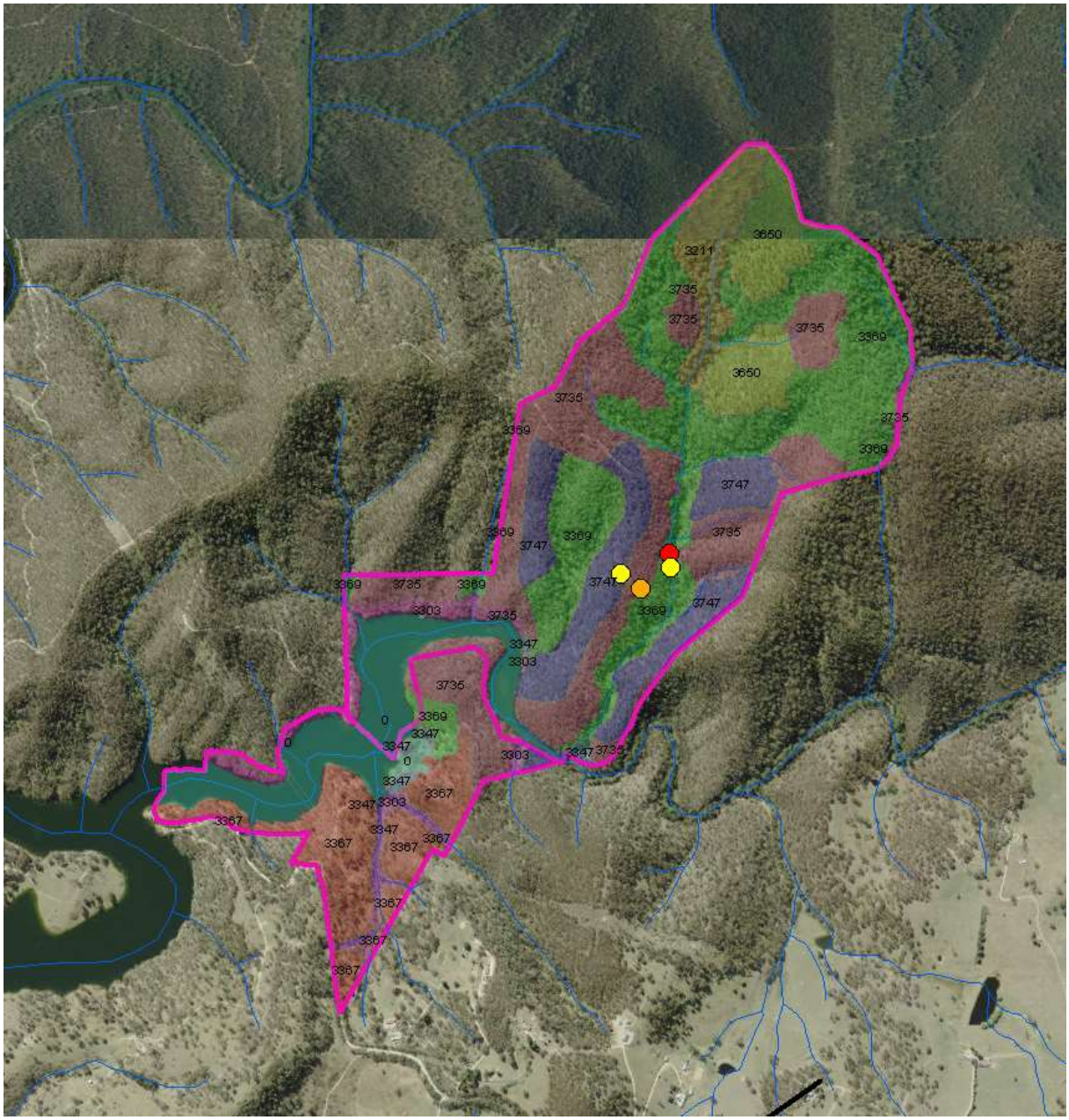
i Powerful Owl

Powerful Owl: signs of breeding activity have been observed. A pair was seen together after a response to call-playback (red dot below). Duetting was also observed on another occasion. Roost-watching and passive listening surveys were undertaken to try to locate a nesting site. A nesting location has not been confirmed however, a suspected nesting site (orange dot inside orange circle below) has been found; a tall tree with a DBH of approximately 2 m, containing two hollows > 40 cm entrance diameter, patches of whitewash nearby, a Powerful Owl feather, and calls heard from locations nearby. Other locations where the species was either heard during listening surveys or recorded on song meters are indicated by yellow dots below.


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3367

ii Sooty Owl

Recorded on songmeter (red spot below). A single bird was observed (orange dot) and later heard calling from approximately 300 m to the north. Calls also heard about 100-150 m from the two yellow dots to the north and south.



1.3 Questions regarding survey requirements

The following outlines EMM request for clarification regarding species survey requirements:

1. For owls in general, and any species in particular, should we undertake or avoid call playback surveys during the breeding season?

2. From an animal ethics perspective, if we do survey using call playback, how frequently can we survey without causing too much disruption?

3. If we use song meter surveys (alone or in conjunction with call-playback and passive listening) to determine presence or absence of species during the breeding season, what level of effort would be required?

4. Given the relatively high density of potential nesting hollows on the site, can we use an area-based survey approach to detect breeding owls?

5. Would the following approach be supported?

    a) Establish a grid across the area containing potential nesting trees

    b) An observer spending approximately 0.5 hours immediately before and 1 hour after listening and watching for owls during the species' breeding season on two nights for each 4 hectares of potential breeding habitat; i.e. observing a radius of approximately 100 m around a central point.

    c) Observers carefully approaching any owls detected in an attempt to locate nest sites.

6. Would you have any other suggestions for a survey approach?

7. If a breeding site for a species is detected, is it reasonable to assume that no other pairs of the species would be nesting nearby due to territorial behaviour?

Thank you for your assistance. If you would like to discuss the contents of this memo further, please feel free to contact me on 0412 350 481.

Yours sincerely



Paul Rossington
Associate Ecologist
prossington@emmconsulting.com.au

6 November 2023

Liz Mazzer
A/Senior Team Leader
Biodiversity, Conservation and Sciences Directorate
Sent via email:
liz.mazzer@environment.nsw.gov.au

Project Name: Lake Lyell PHES EIS - Purple Copper Butterfly / Bathurst Copper Butterfly- survey requirement clarification memorandum
Project Number: E221111

1 Introduction

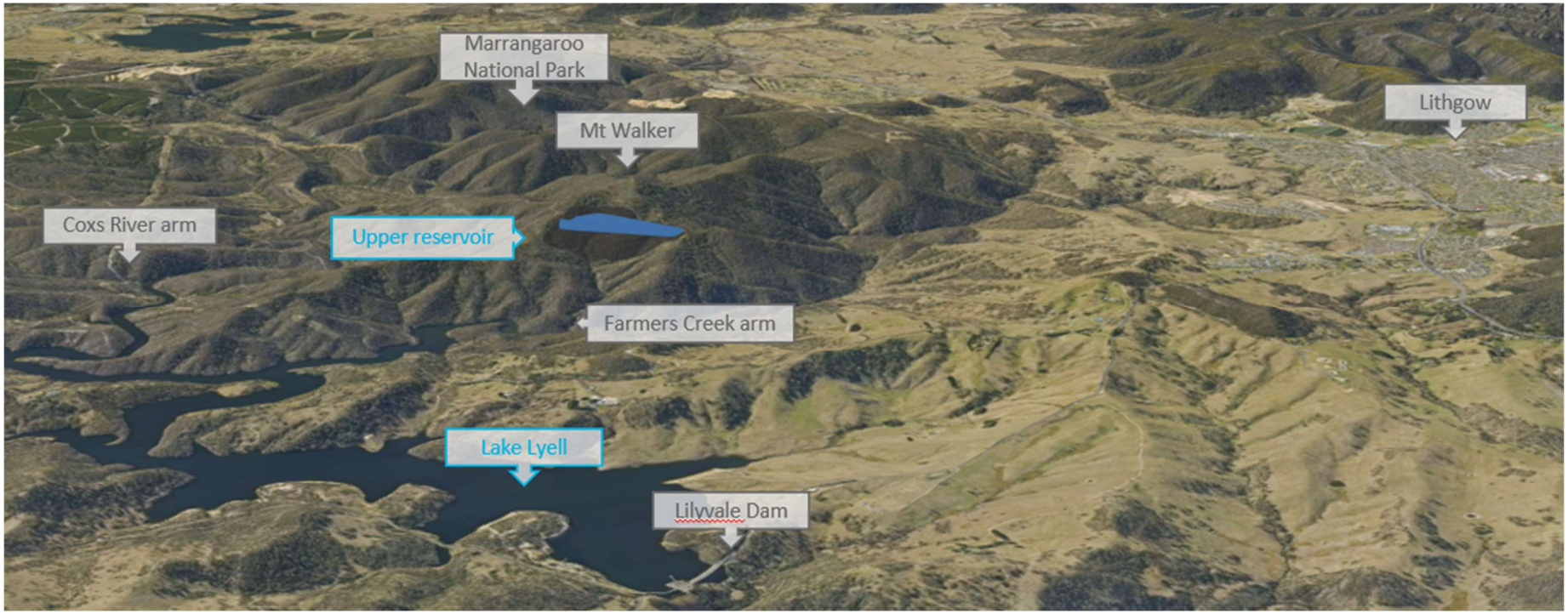
An initial meeting and discussion was held between the Lake Lyell PHES EIS project team and Liz Mazzer of the Biodiversity, Conservation and Sciences Directorate (BCS) on 23 October 2023. During the meeting, clarification of survey requirements for some species was discussed and EMM agreed to provide a series of memos for review by the relevant BCS accountable officer to assist clarification and responses for individual species.

To ensure the project meets expected survey requirements and adequately informs the preparation of the Biodiversity Development Assessment Report, this memorandum seeks to clarify survey requirements for Purple Copper Butterfly / Bathurst Copper Butterfly (*Paralucia spinifer*).

Information presented herein is based on survey effort to date and/or planned for the species, and with reference to the current guidelines.

1.1 Selected information relevant to survey requirements

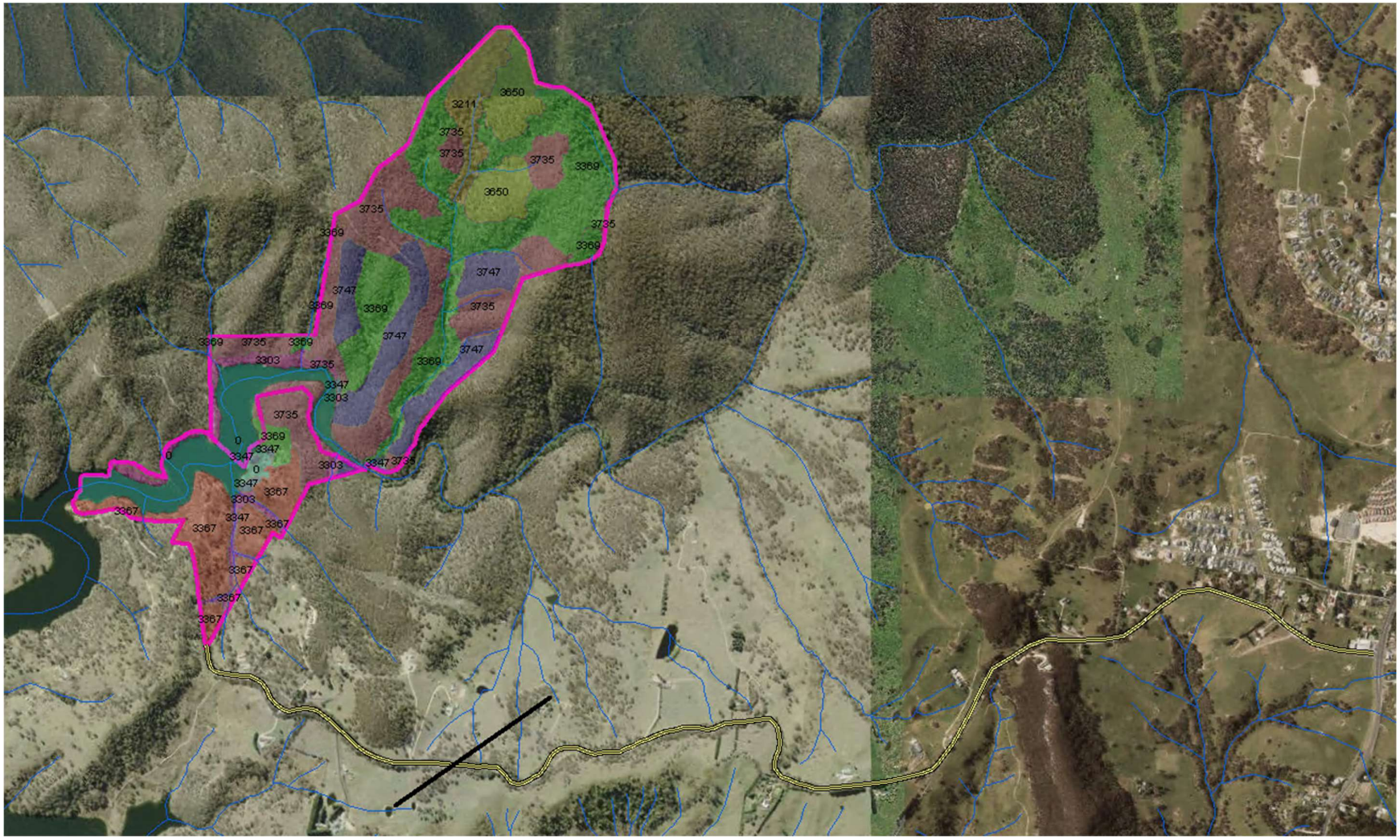
1.1.1 Site location



NB: the site is almost entirely within the Hill End IBRA Subregion with part of the main access route within the Bathurst IBRA subregion. PCTs have not been confirmed for the access route but only relatively small amount of clearing is likely to be required there along the edge of the existing road.

1.1.2 Draft PCT mapping

8 PCTs are mapped at present but some refinement of mapping is still required; 3211, 3303, 3347, 3367, 3369, 3650, 3735, 3747



1.1.3 Geographic restrictions

“Above 800 m altitude.”

NB: Except for the lower slopes around the lake edge, the site is generally above 800 m altitude.

1.1.4 Habitat Constraint

“Bursaria spinosa or within 40m of Bursaria spinosa”

1.1.5 TBDC Survey Comments

“To survey adults requires full sunshine and temperature above 15 degrees, individual adults live for approximately 2 weeks however a site can be active for much longer as adults emerge. The peak flying period will vary between sites likely elevation and aspect play a role, seasonal changes may also influence the timing of the flying season. Larvae are detectable at night in December when they are in the later stages of development and escorted by many attendant ants. Note that larvae are also present in Nov, but very small and difficult to detect.”

“DPIE is currently drafting survey guidelines for a range of invertebrate species. Please contact DPIE for advice on species survey requirements.”

1.1.6 EIS Guidelines

“Current knowledge suggests that P. spinifera occurs only at altitudes in excess of 900 metres…”

“Aspect, geology, vegetation overstorey species are sufficiently variable at known locations of P. spinifera to preclude their use as factors in identifying potential P. spinifera habitat.”

“It is recommended that potential habitat for P. spinifera be identified by the presence of Bursaria spinosa subsp. lasiophylla at locations above approximately 900 metres in altitude.”

“P. spinifera has been described by adult (butterfly) morphological features (Edwards and Common 1978), hence an adult must be examined to confirm identification.”

“Survey of potential habitat for P. spinifera should be designed in cognisance of; records of adult emergence occurring between August and November, the factors affecting activity (eg. weather), the emergence of adults at nearest known sites…”

“…the spatial distribution of B. spinosa subsp. lasiophylla affects its availability to larvae, which are not known to cross open ground to graze only reaching additional plants by traversing interconnecting branchlets.”

1.1.7 EPBC Act Conservation Advice

“It occurs in eucalypt woodland, mainly in open clearings (Sands & New 2002). All locations are above 900 m in altitude and are associated with the presence of the larval food plant..”

“Without new blackthorn growth promoted by post-disturbance conditions, the blackthorn often becomes unsuitable habitat, and the purple copper butterfly can become locally extinct (Nally, pers comm., 2016).”

“sites range from habitat remnants with clusters of less than ten blackthorn plants, to sites with blackthorn scattered or clumped over several hectares.”

“When present in otherwise comparable habitat, butterfly activity levels appear to be correlated with the amount of fresh young blackthorn leaves available (Nally, pers comm., 2016).”

1.1.8 Recovery Plan

“The topographic position and orientation varies considerably between the butterfly sites.”

“A commonality between sites is that they are subjected to extremes of cold.”

"Another common factor between habitat at sites is the exposure of Bursaria spinosa ssp lasiophylla to direct sunlight for a large portion of the day, due to orientation and / or canopy openness. The majority of sites have a westerly to northerly aspect. Sites located on south facing slopes are generally high enough and flat enough to ensure that they also receive full sun."

"Bathurst Copper Butterfly require a vegetation structure that is exposed to all-day sun. A commonality between all known sites is an aspect and open vegetation that allows a high level of solar radiation."

"Almost all sites are associated with significant levels of disturbance such as mining, roadways or frequent fire that have resulted in an open vegetation structure and an understorey dominated, or well represented, by Blackthorn."

"The larvae graze on the host plant Bursaria spinosa subsp. lasiophylla. As the larvae will not traverse open ground to reach the host plant, closely spaced B. spinosa subsp. lasiophylla with intertwining branchlets offer the best habitat for grazing larvae."

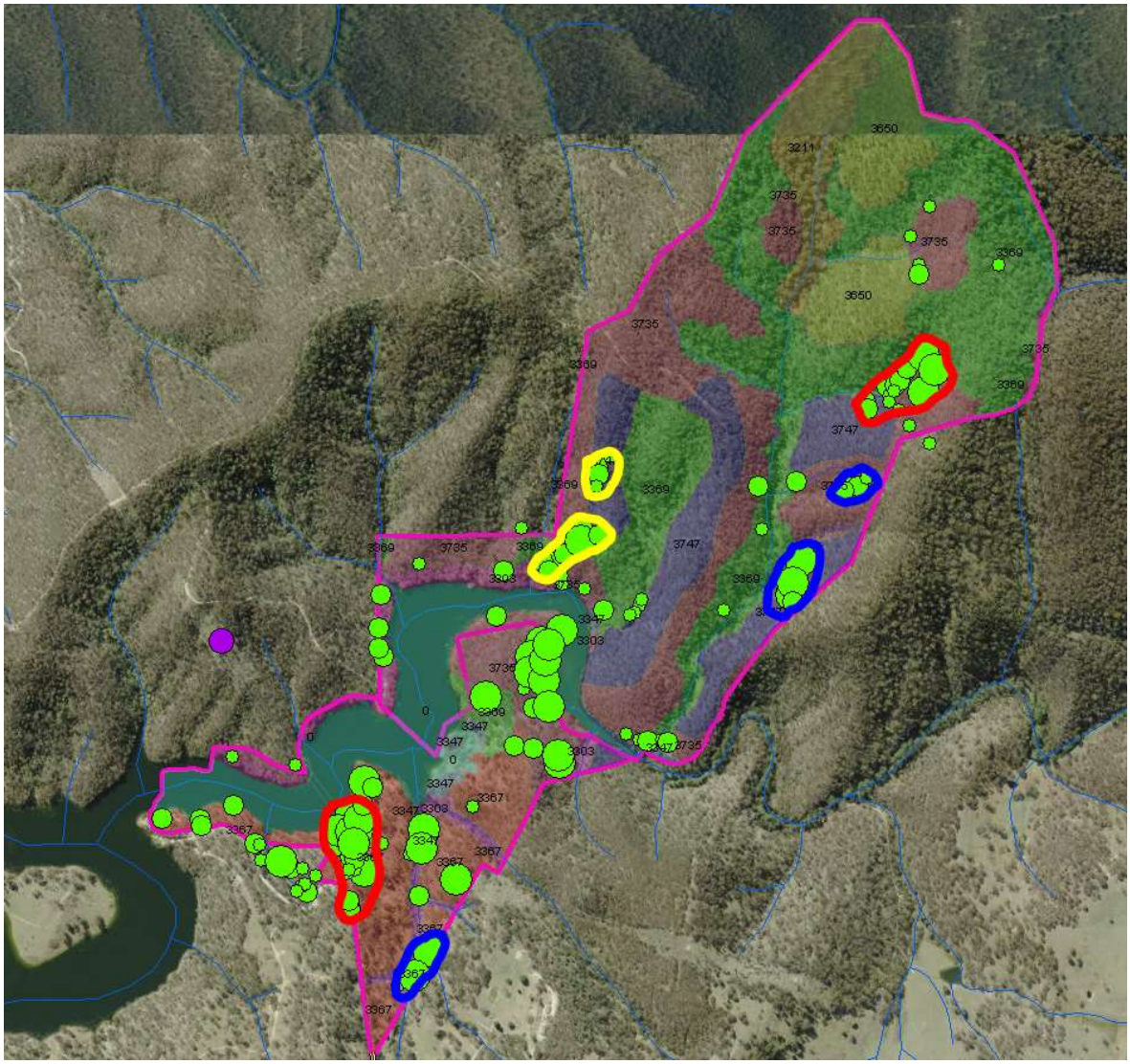
"The density and spatial arrangement of the Blackthorn appears to largely determine the number of adults (Common & Waterhouse 1981; Dexter & Kitching 1991a), with closely spaced individuals with intertwining branchlets thought to provide the most accessible grazing for larvae."

1.2 Field survey effort and findings to date

A summary is mapped overleaf. Green circles represent *Bursaria spinosa* patches of varying size. Surveys to date have been completed in September and October 2023.

Highly variable, at times, cold, cloudy windy and wet conditions during September and October limited the ability to survey all areas containing *Bursaria spinosa*. Consequently surveys were concentrated in the areas that appeared most suitable due to their higher numbers and density of *Bursaria spinosa*, lower canopy percentage cover, and north or west aspect and elevation.

Surveys are ongoing and not all data has been collated but a summary is provided here. The areas circled in red have been visited by EMM ecologists on four occasions, those in blue on two occasions and those in yellow on one occasion. On all occasions, the weather was sunny and temperature above 15 degrees Celsius.



During each survey period, the known population near the end of Stephenson Street in Hermitage Flat was checked to ensure that the Bathurst *Paralucia spinifera* could be readily detected. See records on Inaturalist by Paul Rossington from that site. Each survey involved four observers spending approximately 15-30 minutes (depending on patch size) looking for flying butterflies.

The purple circle represents a location where a Purple Copper Butterfly was opportunistically observed and photographed outside of the site, in the powerline easement at the edge of Marrangaroo National Park. See photo below, taken on October 6, 2023.

Small butterflies, were recorded during all surveys, including Bright Copper (*Paralucia aurifera*), Heath Ochre (*Trapizites phigalia*), Rayed Blue (*Candalides heathi*), Double-spotted Line Blue (*Nacaduba biocellata*). The most similar and closely related species, the Bright Copper, was only observed south of Lake Lyell within and near the powerline easement and in the powerline easement north of the lake where the Purple Copper Butterfly was observed.



Photograph 1.1 Purple Copper Butterfly (*Paralucia spinifera*) observed in a powerline easement at the edge of Marrangaroo National Park

1.3 Questions regarding survey requirements

The following outlines EMM request for clarification regarding species survey requirements:

1. Can EMM adopt the following to guide refinement of potential habitat for the species:

a) Exclude areas where *Bursaria spinosa* is only found as isolated (> 40 m from the next patch), individual plants or small (< 10 plants) patches of plants that are not intertwined

b) Exclude areas that are not exposed to nearly all-day sun due to vegetation structure and/or aspect.

2. For each area of suitable habitat, how much survey effort is required?

   a) How much effort per survey?

   b) How many repeat visits?

   c) Do we need to survey for both adults butterflies and larvae at each site?

3. Can you provide any resources to assist in the identification of larvae noting that the related species Bright Copper Butterfly (*Paralucia aurifera*) has been detected on site? We will check a reference site to familiarise ourselves with the larvae however help with distinguishing features and photos would be of assistance.

Thank you for your assistance. If you would like to discuss the contents of this memo further, please feel free to contact me on 0412 350 481.

Yours sincerely



Paul Rossington
Associate Ecologist
prossington@emmconsulting.com.au

6 November 2023

Liz Mazzer
A/Senior Team Leader
Biodiversity, Conservation and Sciences Directorate
Sent via email:
liz.mazzer@environment.nsw.gov.au

Project Name: Lake Lyell PHESS EIS - Superb Parrot - survey requirement clarification memorandum
Project Number: E221111

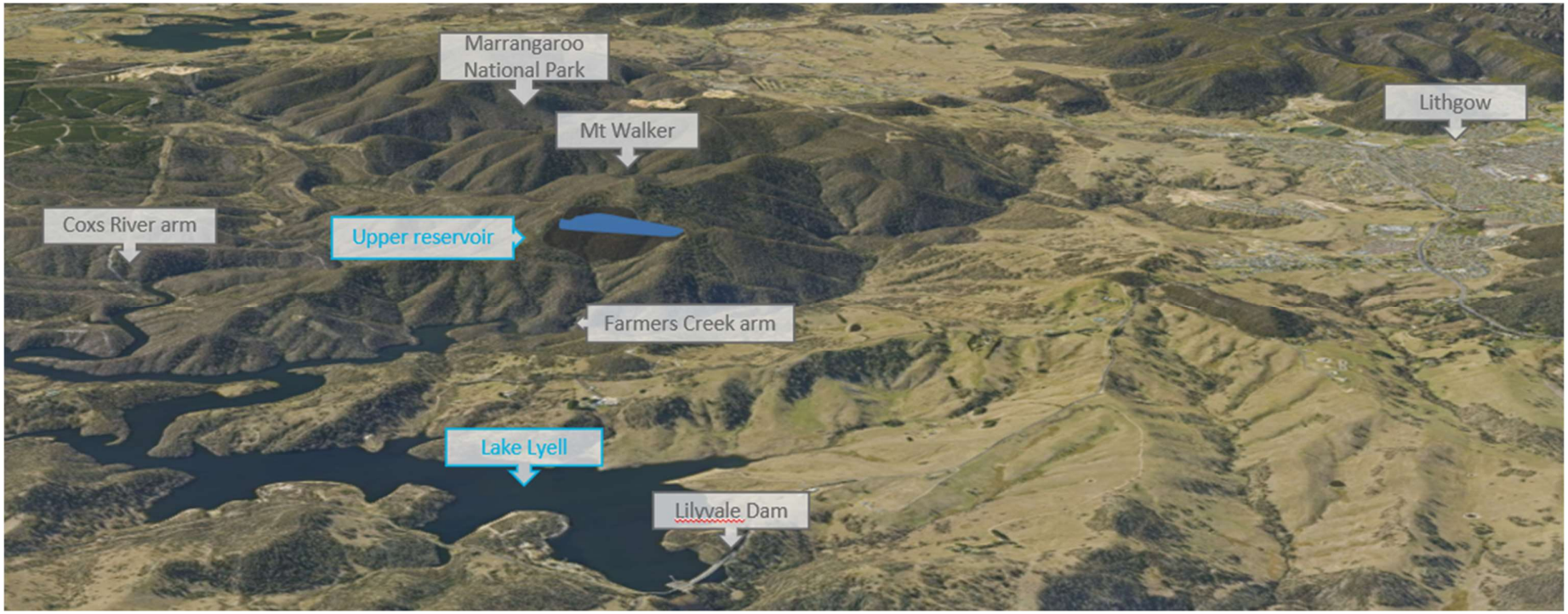
1 Introduction

An initial meeting and discussion was held between the Lake Lyell PHES EIS project team and Liz Mazzer of the Biodiversity, Conservation and Sciences Directorate (BCS) on 23 October 2023. During the meeting, clarification of survey requirements for some species was discussed and EMM agreed to provide a series of memos for review by the relevant BCS accountable officer to assist clarification and responses for individual species.

To ensure the project meets expected survey requirements and adequately informs the preparation of the Biodiversity Development Assessment Report, this memorandum seeks to clarify survey requirements for Superb Parrot (*Polytelis swainsonii*).

1.1 Selected information relevant to survey requirements

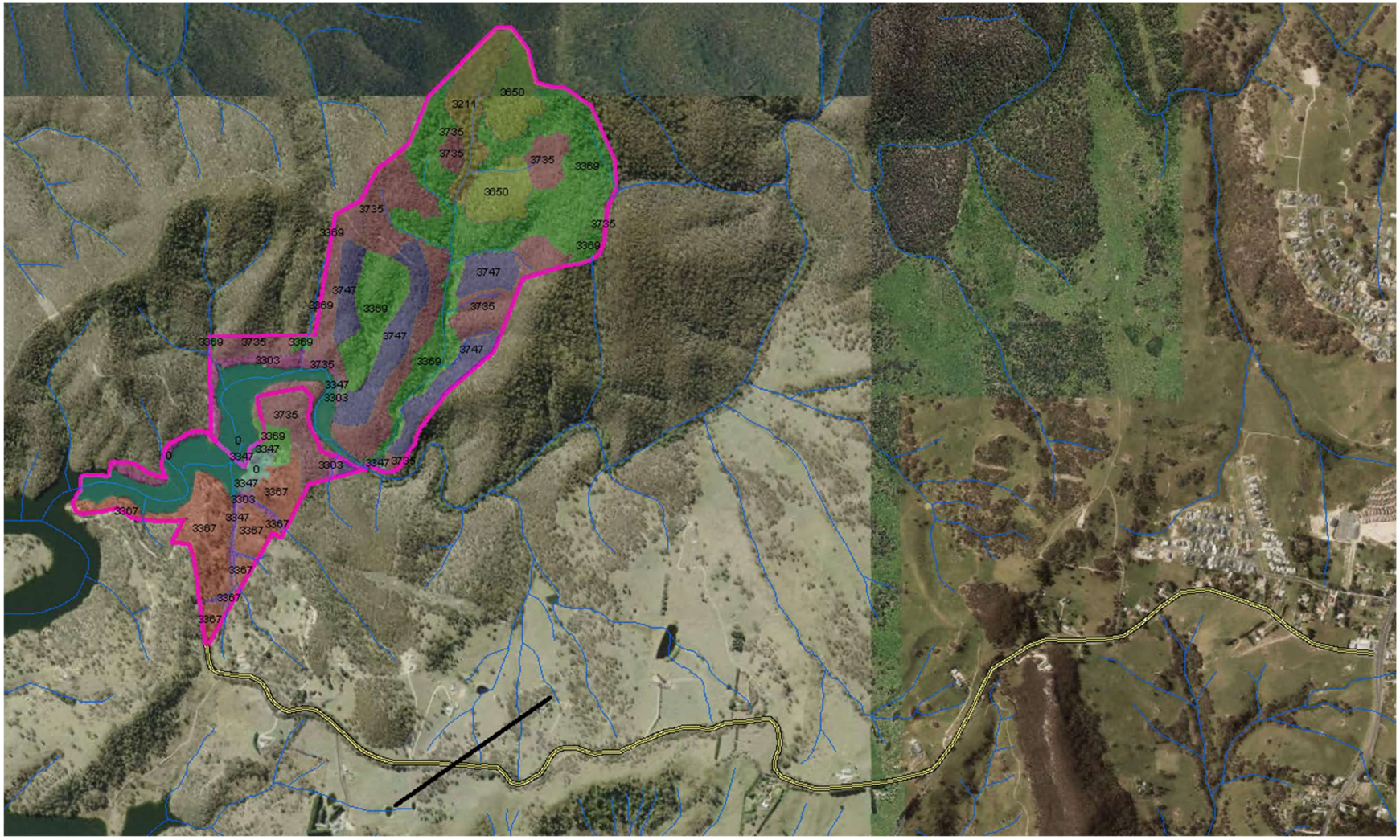
1.1.1 Site location



NB: the site is almost entirely within the Hill End IBRA Subregion with part of the main access route within the Bathurst IBRA subregion. PCTs have not been confirmed for the access route but only relatively small amount of clearing is likely to be required there along the edge of the existing road.

1.1.2 Draft PCT mapping

8 PCTs mapped at present but some refinement of mapping is still required; 3211, 3303, 3347, 3367, 3369, 3650, 3735, 3747



1.1.3 Threatened Biodiversity Data Collection

Habitat constraint: Living or dead **E. blakelyi, E. melliodora, E. albens, E. camaldulensis, E. microcarpa, E. polyanthemos, E. mannifera, E. intertexta** with hollows greater than 5cm diameter; greater than 4m above ground or trees with a DBH of greater than 30cm.

General Notes: Breeding habitat can be identified by the presence of habitat features and observed nest OR two or more birds seen on site.

DPIE is currently developing survey guidance for threatened bird species. In the interim, assessors must undertake a species survey using best practice methods that can be replicated for repeat surveys (as per the BAM threatened species survey requirements).

1.1.4 Recovery Plan excerpts

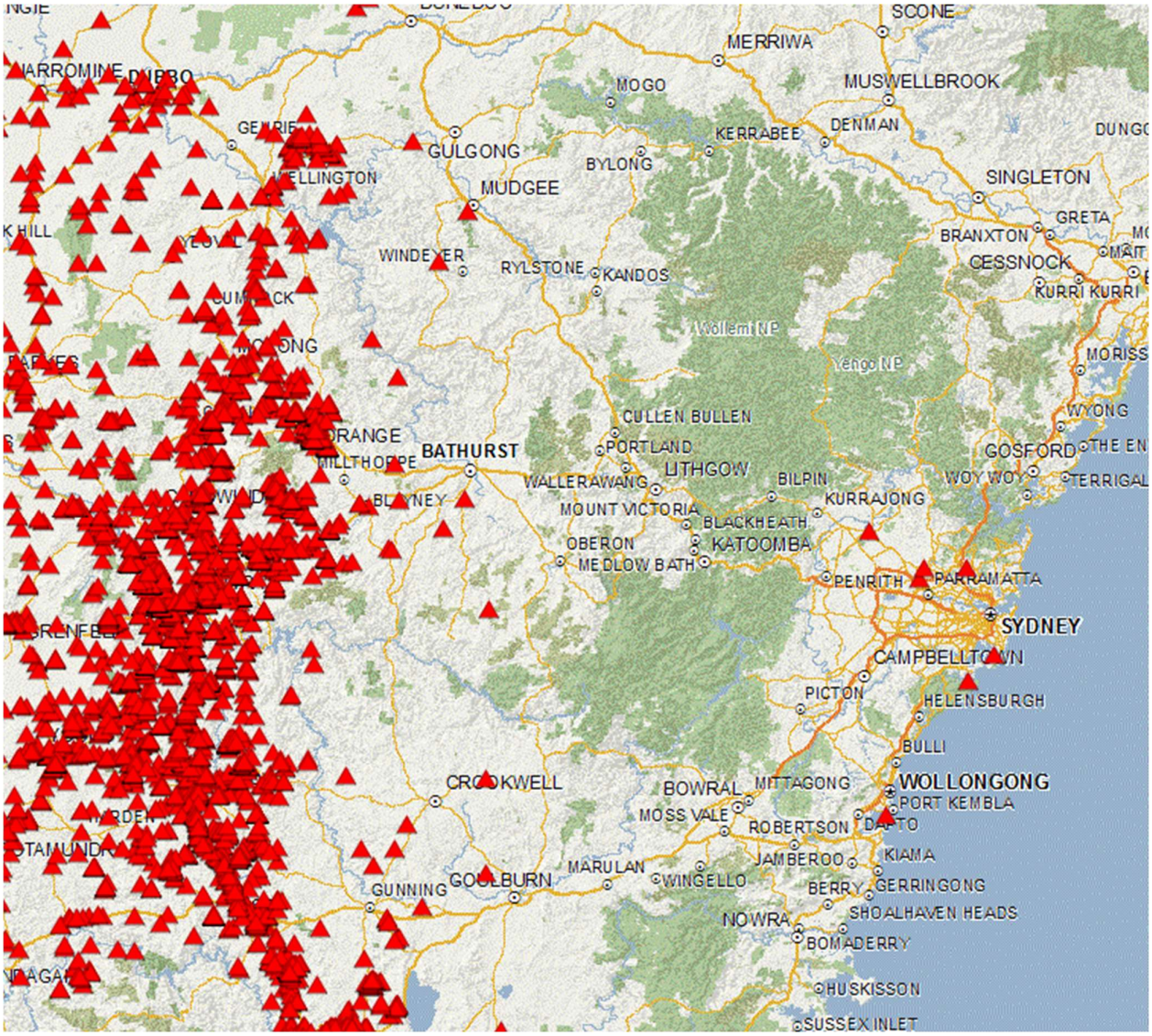
"There are three main breeding areas: an area of the south-west slopes bounded by Molong, Rye Park, Yass, Coolac, Cootamundra and Young (NSW); along the Murrumbidgee River, between Wagga Wagga and Toganmain Station, and farther north at Goolgowi (NSW); and along the Murray and Edward Rivers, from east of Barmah and Millewa State Forest to south of Taylors Bridge (NSW and Victoria) (Baker-Gabb 2011)"

"In the Riverina, the Superb Parrot nests in loose colonies in large, living or dead trees with many hollow branches, typically near watercourses. On the inland slopes, they use at least six species of eucalyptus (Webster 1988) but have a particular reliance on Blakely's Red Gum (Eucalyptus blakelyi) (Manning et al. 2006; Rayner et al. 2015b, 2016). An assumed reliance on White Box (E. albens) and Yellow Box (E. melliodora) (Webster 1988) remains unproven (Manning et al. 2006). Rayner et al. (2015b, 2016) also found Superb Parrot nests in Scribbly Gum (E. rossii). Most nest sites are within 10 km of box-gum woodland and are sometimes within it (Manning et al. 2004), and parrots typically forage up to 9 km from their nest site (Rayner et al. 2015b)."

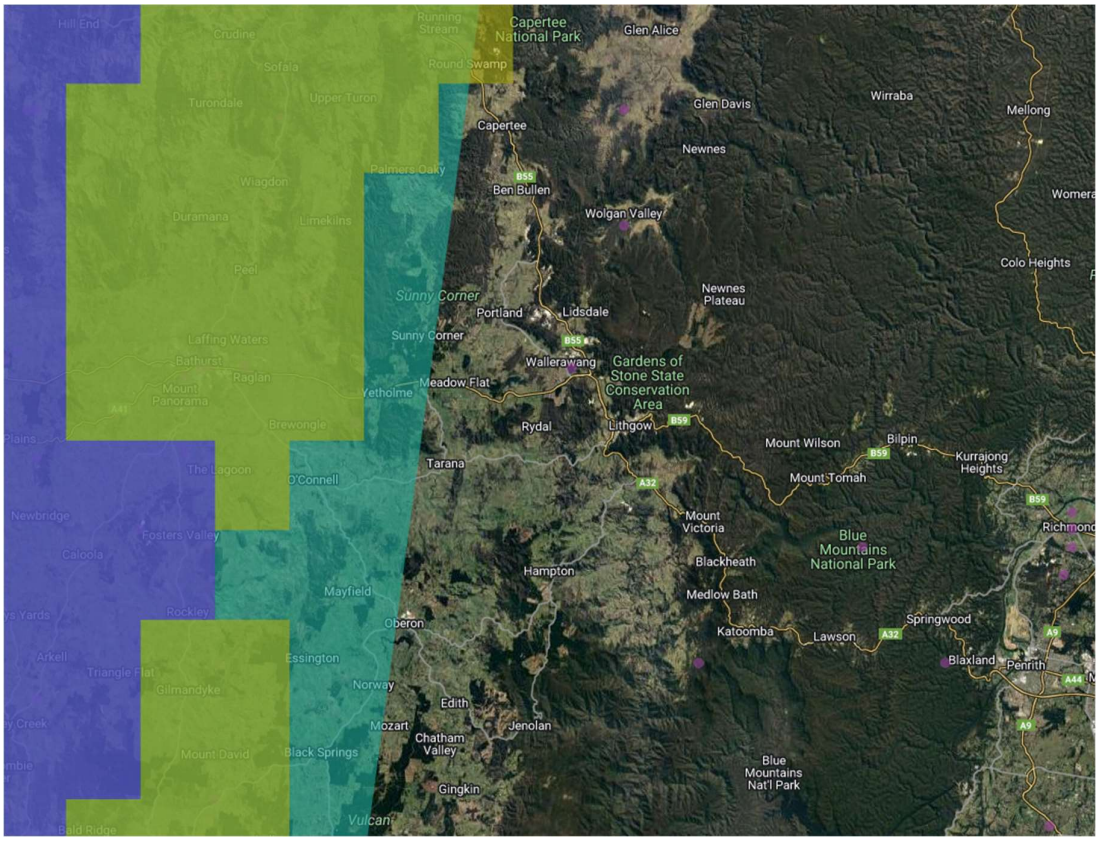
"The two main distinct habitat types used for breeding: riverine forests in the Riverina, and box-gum woodlands in the tablelands and slopes of Victoria, New South Wales and the Australian Capital Territory (also see Key Biodiversity Areas)."

1.1.5 Species known and predicted distribution

Records on the Bionet Atlas of NSW Wildlife


SCONE
MERRIWA
MUSWELLBROOK
MOGO
DENMAN
KERRABEE
BYLONG
GULGONG
MUDGEE
SINGLETON
GRETA
BRANXTON
CESSNOCK
KURRI KURRI
WINDEXER
RYLSTONE
KANDOS
Wollemi NP
Yengo NP
WYONG
CULLEN BULLEN
PORTLAND
LITHGOW
BATHURST
GOSFORD
WOY WOY
WALLERAWANG
BILPIN
KURRAJONG
MOUNT VICTORIA
BLACKHEATH
OBERON
KATOOMBA
MEDLOW BATH
PENRITH
PARRAMATTA
SYDNEY
CAMPBELLTOWN
PICTON
HELENSBURGH
BULLI
WOLLONGONG
PORT KEMBLA
CROOKWELL
BOWRAL
MITTAGONG
MOSS VALE
ROBERTSON
KIAMA
JAMBEROO
MARULAN
WINGELLO
BERRY
GERRINGONG
GOULBURN
GUNNING
NOWRA
SHOALHAVEN HEADS
BOMADERRY
HUSKISSON
SUSSEX INLET

Modelled distributions for the species in the Talas of Living Australia (ALA)



1.2 Field survey findings to date

Surveys conducted to date between June and October 2023 (though not yet complete) include:

- PCT assessment and mapping
- Habitat assessment
- Tree-hollow mapping
- Targeted owl surveys
- Targeted brush-tailed Phascogale and Squirrel glider surveys
- Targeted searches for threatened plants
- Targeted searches for Purple Copper Butterfly / Bathurst Copper Butterfly
- Targeted searches for Gang-gang Cockatoo and Glossy Black Cockatoo

Threatened diurnal birds recorded to date include Gang-gang Cockatoo, Glossy Black Cockatoo, Scarlet Robin, Dusky Woodswallow, Varied Sittella and White-bellied Sea-eagle.

There have been no sightings of Superb Parrot.

1.3 Comments and questions regarding survey requirements

While there are some E. melliodora and E. mannifera that may meet the habitat constraint for the species, the habitat and location of the site do not appear to closely resemble known breeding areas for the species.

EMM is seeking endorsement from BCS in assuming the species is a vagrant or at least unlikely to breed in the study area, given:

- the scarcity of records in the locality of this conspicuous species,
- its location outside of modelled distributions for the species in ALA,
- its location well away from known breeding areas, and
- absence of typical breeding habitat.

If survey for the species' breeding habitat is required, can it be restricted to areas containing the specific tree species quoted in the TBDC and can an area-based, as opposed to hollow-based, approach be used for surveys?

Thank you for your assistance. If you would like to discuss the contents of this memo further, please feel free to contact me on 0412 350 481.

Yours sincerely



Paul Rossington
Associate Ecologist
prossington@emmconsulting.com.au

Department of Climate Change, Energy, the Environment and Water

Our ref: DOC24/45784

Paul Rossington
Associate Ecologist
EMM Consulting
prossington@emmconsulting.com.au

Dear Paul,

Lake Lyell – Gang-gang cockatoo survey requirements

I refer to your e-mail dated 11 January 2024 to the Biodiversity, Conservation and Science Group (BCS) of the Department of Climate Change, Energy, the Environment and Water (DCCEEW) requesting guidance on survey requirements for gang-gang cockatoo in the Lake Lyell PHES project area.

Gang-gang cockatoos are not an easy species in which to confirm breeding as many pairs exhibit elusive and secretive behaviour near nests.

BCS recommend that a tiered approach be implemented. Areas can be removed from the potential species polygon based on confirmation of the absence of habitat features, e.g., vegetation that did not contain hollows of the required size at the required height during surveys. In relatively open vegetation the 20-minute area-based survey approach proposed would be supported by BCS. However, in more heavily timbered areas it is unlikely that 20 minutes would be sufficient to locate all potential hollows and detect breeding activity in a one-hectare area.

Inspection of a hollow is insufficient evidence to conclude a hollow as a nesting site, as nesting behaviour does not necessarily result in hollow use. However, renovation of a hollow indicates that the site is being used and would be considered sufficient to confirm the hollow as a nest site. Additionally, the presence of a male, or pair, within 20 metres of a potential hollow during the core breeding period would strongly indicate that the hollow may be a nest site and would warrant further observation.

Noting the extensive repeated survey effort required to locate all actual nest trees on the project site to determine breeding, BCS recommend that the survey effort prioritise the elimination of areas that do not contain suitable hollows, then establish the location of potential nest hollows, assume presence, and create polygons accordingly.

If you have any questions about this advice, please do not hesitate to contact David Geering, Senior Conservation Planning Officer, via david.geering@environment.nsw.gov.au or (02) 6885 0335.

Yours sincerely,



Samantha Wynn
Senior Team Leader Planning, North West
Biodiversity, Conservation and Science Group
24 January 2024

Your ref: E221111
Our ref: DOC24/101389

Paul Rossington
Associate Ecologist
EMM Consulting
prossington@emmconsulting.com.au

Dear Paul,

Lake Lyell – glossy-black cockatoo survey requirements

I refer to your memo dated 7 December 2023 to the Biodiversity, Conservation and Science Group (BCS) of the Department of Climate Change, Energy, the Environment and Water (DCCEEW) requesting guidance on survey requirements for glossy-black cockatoo in the Lake Lyell project area. The guidance requested in your memo for our response has been provided below:

1. ***Given the density of potential nesting hollows on the site, can we use an area-based survey approach to detect breeding birds?***
2. ***Would the following approach be supported?***

    a) Establish a 100 m grid across the area containing potential nesting trees

    b) An observer spending approximately 15-20 minutes in each 100 m x 100 m grid cell during the species' breeding season, searching for and recording suitable nesting hollows and glossy-black cockatoo breeding activity.

Confirming breeding for glossy-black cockatoos is challenging as many pairs exhibit secretive behaviour near nests. In addition, their contact calls are typically discreet wheezing and grating sounds, repeated over a short time. This makes detection and triangulation of individuals difficult, especially in densely treed habitat.

In accordance with the Threatened Biodiversity Data Collection (TBDC) survey requirements, we recommend that signs of breeding are first confirmed within the site, via comprehensive dedicated surveys. If signs of breeding are detected, an assessment of all suitable hollow-bearing trees will be required to determine its use by the glossy-black cockatoo.

In relatively open vegetation the 20-minute area-based survey approach proposed may be considered appropriate. However, in more heavily treed areas it is unlikely that 20 minutes would be sufficient to locate all potential hollows and detect breeding activity in a one-hectare area.

In general, we advise that a high density of hollows will require a commensurately large survey effort. If signs of breeding are confirmed and assessment of potential breeding habitat is required, we recommend that a tiered approach be implemented. Areas can be removed from further assessment based on confirmation of the absence of habitat features, e.g, vegetation which does not contain suitable hollows.

3. ***Would you have any other suggestions for a survey approach?***

In consultation with the species expert, we have previously provided advice to accredited assessors on a suggested approach to surveying glossy-black cockatoos, where signs of breeding

have been detected. The advice applied to densely treed habitat which contained a resident population. As per your request, a copy of this advice has been provided in **Attachment A.**

4. ***Is observation of a pair of birds inspecting or renovating a tree hollow sufficient evidence to conclude that the hollow constitutes an actual nest site and is there anything to be gained from revisiting any such locations to verify actual nesting?***

We agree that renovation of a hollow would be considered sufficient to confirm the hollow as a nest site. Additionally, the presence of a male, or pair, within 20 metres of a potential hollow during the core breeding period would strongly indicate that the hollow may be a nest site and would warrant further observation. A nesting tree can also be assumed present, in accordance with section 5 of the Biodiversity Assessment Method (BAM).

The project will need to demonstrate that reasonable steps have been undertaken to avoid and minimise impacts to biodiversity values. We recommend that nesting trees for the species are prioritised for avoidance, in accordance with section 7 of the BAM, when the proponent is finalising the project design.

If you have any questions about this advice, please do not hesitate to contact Ben Ellis, Principal Project Officer, via ben.ellis@environment.nsw.gov.au or (02) 8275 1838.

Yours sincerely,



CALVIN HOULISON
Senior Team Leader Planning, North West
Biodiversity, Conservation and Science Directorate

12 February 2024

BCS's Suggested Survey Approach

Surveying for suitable hollow-bearing trees

The specific methods of surveying the site for hollow-bearing trees should be guided by the context of the survey area. The survey effort should be guided by the knowledge of the accredited assessor on what would be required to systematically identify all potential nest trees (as per the definition of suitable hollows in the TBDC).

If a potential nest tree is found, we recommend the following is recorded:

- tree GPS location;
- estimate of tree diameter at breast height
- estimate of hollow height (at least 8 m above the ground);
- estimate of hollow location (in stems with a diameter of at least 30 cm, stem angle is at least 45 degrees, and may be near-vertical or vertical); and
- estimate of hollow diameter (at least 15 cm).

This method can be used to refine and rule out areas that do not contain potential nesting trees, and thus do not require further survey.

Confirming the presence of nesting trees

Once hollow-bearing trees are identified, we recommend trees are surveyed over a minimum of two nights in the breeding season separated by at least a month. This is because there is variation in the species laying date. Watch from 2-hours before sunset till around 30 minutes after sunset (i.e., the canopy is dark).

In general terms, a surveyor would only be able to watch a single tree each evening (unless trees are next to each other). It's also recommended surveyors stag watching keep a keen ear out for incidental calls of the glossy-black cockatoo and follow up on these calls if possible.

Reporting Results

It is recommended that reporting on survey outcomes provide detail of the survey method, justify survey effort undertaken (i.e. providing mapped target survey locations, hand held GPS tracks etc.) and discuss any potential limitations relating to the survey outcomes. Further information of targeted survey reporting requirements can be found in the BAM 2020 and Bam Ops Manual (Stage 1).

Paul Rossington

From: Ben Ellis <Ben.Ellis@environment.nsw.gov.au>
Sent: Monday, 5 February 2024 1:03 PM
To: Paul Rossington
Cc: Alex Frolich; Liz Mazzer
Subject: RE: Lake Lyell pumped hydro project (SSD-60598738) - Gang-gang Cockatoo survey requirement clarification memo

CAUTION: This email originated outside of the Organisation.

Hi again Paul,

Just looking at your Forest Owl queries, specifically Q3.

Similar to the Brush-tailed Phascogale, if you'd like to send a proposed array of song meters (inclusive of those which have already been deployed) I can run the proposal past the species expert.

Any queries please call or email.

Regards

Ben Ellis
Principal Project Officer (North West Region)
Biodiversity, Conservation & Science | Department of Climate Change, Energy, the Environment and Water
T 02 8275 1838 | **M** 0472 875 194 | **E** ben.ellis@environment.nsw.gov.au
dcceew.nsw.gov.au

NSW GOVERNMENT

From: Ben Ellis
Sent: Monday, 5 February 2024 10:55 AM
To: Paul Rossington <prossington@emmconsulting.com.au>
Cc: Alex Frolich <afrolich@emmconsulting.com.au>; Liz Mazzer <Liz.Mazzer@environment.nsw.gov.au>
Subject: RE: Lake Lyell pumped hydro project (SSD-60598738) - Gang-gang Cockatoo survey requirement clarification memo

Hi Paul,

Lovely to chat.

Thanks for your patience whilst we look at the survey methods below, after finishing up the crazy Dec-Jan period.

As discussed, if you could provide a proposed camera array for the Brush-tailed Phascogale (inclusive of those detailed in Section 1.2 of the memo and any others to meet the total summarised in Section 1.3) I can take this to the AO for discussion. Spatial files of habitat, site boundary and proposed cameras would also be useful to expedite our response.

Paul Rossington

From: Liz Mazzer <Liz.Mazzer@environment.nsw.gov.au>
Sent: Wednesday, 15 November 2023 10:56 AM
To: Paul Rossington
Subject: RE: Lake Lyell pumped hydro project (SSD-60598738) - Purple Copper Butterfly

CAUTION: This email originated outside of the Organisation.

Hi Paul
I've received feedback from accountable officer for purple copper butterfly as follows:

Answers to questions in your memo

1. Can EMM adopt the following to guide refinement of potential habitat for the species:
   a) Exclude areas where Bursaria spinosa is only found as isolated (> 40 m from the next patch), individual plants or small (< 10 plants) patches of plants that are not intertwined
   b) Populations can occur in isolated patches, and can re-colonise potential habitat. Plants do not need to be intertwined to support the butterfly and its larvae. Individual larvae are just less likely to move between plants that aren't intertwined. Adults still lay their eggs on plants that aren't intertwined, and individual plants can support numerous larvae. Therefore it would not be appropriate to exclude areas where Bursaria spinosa is only found as isolated (> 40 m from the next patch), individual plants or small (< 10 plants) patches of plants that are not intertwined.

   c) Exclude areas that are not exposed to nearly all-day sun due to vegetation structure and/or aspect.
   d) This species is an early successional specialist (it's prime habitat niche is 2-4 years post fire). The vegetation structure of an area that is not currently exposed to 'nearly all day sun' can change when a fire occurs. Therefore it would not be appropriate to exclude areas that are not exposed to nearly all-day sun due to vegetation structure and/or aspect.

2. For each area of suitable habitat, how much survey effort is required?
   a) How much effort per survey?
   This depends on the potential habitat. When conducting whole-area monitoring at a site, we focus on Bursaria (and the areas between the Bursaria) that are in sunlight. If there are patches of Bursaria in the shade (i.e. under dense canopy or from a hill), then we do not search those patches at that time. Those patches are surveyed at a different time if/when they are in sunlight.

   b) How many repeat visits?
   This depends on the weather conditions and the timing of the surveys. If surveys are conducted during optimal conditions and peak flying period, then fewer surveys will be required. If suboptimal conditions and/or outside of the peak flying period, then more surveys will be required. Detectability is more difficult if it is windy, as the butterflies do not fly as much. The use of a stick to lightly tap plants (including grass and other vegetation) whist searching can help flush them.

   c) Do we need to survey for both adult butterflies and larvae at each site?
   Please refer to the response to Q3 below.

3. Can you provide any resources to assist in the identification of larvae noting that the related species Bright Copper Butterfly (Paralucia aurifera) has been detected on site? We will check a reference site to familiarise ourselves with the larvae however help with distinguishing features and photos would be of assistance.
   BCS is unaware of any resources to assist with larvae identification. This is part of reason why we no longer recommend larvae surveys. Other reasons include (1) the surveys are quite specialised (2) they require greater effort (time, attention and patience), and (3) there appears to be lower detectability for site presence, than there is for adults.

NB. The purple copper butterfly has since been detected <900 m. So we now recommend elevations >850 m, rather than >900 m.

Questions about the memo

- Pg. 6. Have the mapped patches of *Bursaria spinosa* been ground-truthed? The patches that are in close proximity to the preferred location for the upper reservoir need to be surveyed. Even if not present, is still potential habitat due to changes in structure that may occur in the future due to fire. I'm assuming the footprint of the preferred proposed reservoir has been searched for potential habitat?

- When were the surveys conducted? What time were the surveys conducted? Was there rain in the proceeding days? How windy was it? These factors affect detectability and need to be recorded to determine adequacy of surveys and effort.

Additional guidelines for purple copper butterfly survey

Suitable habitat

- All PCTs on the subject land that are associated with the species in the TBDC above 850 m elevation and if *Bursaria spinosa* subsp. *lasiophylla* is present on the site or is within 40 m of *Bursaria spinosa* subsp. *lasiophylla*.

Survey period

- September to mid-October (Adults)
- Reference sites should be monitored during the expected flying period and used to guide survey timing at the target site (aspect, elevation and seasonal variability can influence survey period).

Survey conditions

Adult butterflies

- Warm to hot day (above 15 degrees Celsius by 10 am). Survey should be undertaken during the warmest part the day (between 10am to 2pm)
- Clear or mostly cloudless sky (pause surveys if sun becomes obscured by cloud)
- Calm to low wind (an average of ≤ 1-10 km/h over a 10-minute period. This equates to Beaufort-values of Windforce that are ≤ 2 (light breeze).

Survey effort

Surveys should be repeated three times within the survey period if species is not detected in one of the preceding surveys (under the above survey conditions). Surveys should be repeated at least two weeks apart.

Survey method

Adult butterflies

Meandering transects through suitable habitat targeting *Bursaria spinosa* subsp. *lasiophylla*. GPS tracks of transects need to be recorded. Adults are known to forage on other flowering native species, generally remaining in the vicinity of Bursaria patches. Search from the ground up to a height of 2 m for adults, ensure adjacent open habitat to Bursaria patches is searched for sunning adults. Adults, when disturbed, most often take flight briefly then land close by providing an opportunity to identify individuals to species level.

Regards

Liz

Liz Mazzer
A/Senior Team Leader
Planning, North West

Biodiversity, Conservation and Science Directorate | Department of Planning and Environment
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48 Wingewarra Street Dubbo NSW 2830
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I work part-time Monday to Thursday

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---

From: Paul Rossington <prossington@emmconsulting.com.au>
Sent: Monday, 6 November 2023 3:52 PM
To: Liz Mazzer <Liz.Mazzer@environment.nsw.gov.au>
Cc: Alex Frolich <afrolich@emmconsulting.com.au>; Setter, Robert <Robert.Setter@energyaustralia.com.au>
Subject: Lake Lyell pumped hydro project (SSD-60598738) - Purple Copper Butterfly and Superb Parrot survey requirement clarification memos

Hi Liz,

It was good to meet you and thanks again for your time and offer of assistance with clarifying survey requirements.

Please find attached memos for the Purple Copper Butterfly and Superb Parrot.

I will send through memos for additional species as they are prepared.

If you or the relevant BCS accountable officers would like to discuss the contents of the memos please feel free to contact me.

Thank you

Paul

Paul Rossington
Associate Ecologist

M 0412 350 481
E prossington@emmconsulting.com.au

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Paul Rossington

From: Liz Mazzer <Liz.Mazzer@environment.nsw.gov.au>
Sent: Thursday, 7 December 2023 9:46 AM
To: Paul Rossington
Subject: RE: Lake Lyell pumped hydro project (SSD-60598738) - Superb Parrot survey requirement clarification memo

CAUTION: This email originated outside of the Organisation.

Hi Paul
No worries about the delay. It's that time of the year!
Given the lack of superb parrot records east of Bathurst and the time survey teams have been on site, you have enough to justify excluding the species.
Please ensure that this is specifically documented in the BDAR.
Regards
Liz

From: Paul Rossington <prossington@emmconsulting.com.au>
Sent: Thursday, 7 December 2023 9:27 AM
To: Liz Mazzer <Liz.Mazzer@environment.nsw.gov.au>
Cc: Alex Frolich <afrolich@emmconsulting.com.au>; Setter, Robert <Robert.Setter@energyaustralia.com.au>
Subject: RE: Lake Lyell pumped hydro project (SSD-60598738) - Superb Parrot survey requirement clarification memo

Hi Liz,

Thanks for those responses. Sorry I have not replied earlier. So busy with various surveys at the moment.

Regarding the Superb Parrot, we have had survey teams on site on the following dates:

- 14-16 June
- 4-7 July
- 24 – 28 July
- 21-25 August
- 18-22 September
- 2-6 October
- 16-20 October (including targeted bird surveys)
- 30 October – 3 November (including targeted bird surveys)
- 13 – 17 November (including targeted bird surveys)
- 27 November – 1 December (including targeted bird surveys)
- 4 - 8 December (current) (including targeted bird surveys).

I have not had a chance to collate the bird survey effort to date but a large proportion of the site has been intensively surveyed during October and November and we have been opportunistically recording threatened birds during other surveys.
We have not seen any evidence of the presence of Superb Parrot on site, to date. Please let me know if this is sufficient. Otherwise, I can put together an estimate of the number of hours and spatial distribution of bird surveys in the relevant months.

Thanks

Paul Rossington
Associate Ecologist

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E prossington@emmconsulting.com.au

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From: Liz Mazzer <Liz.Mazzer@environment.nsw.gov.au>
Sent: Wednesday, November 15, 2023 11:43 AM
To: Paul Rossington <prossington@emmconsulting.com.au>
Subject: RE: Lake Lyell pumped hydro project (SSD-60598738) - Superb Parrot survey requirement clarification memos and Platypus contact

CAUTION: This email originated outside of the Organisation.

Hi Paul

Can you please send me your bird survey effort so far? Our superb parrot expert just wants an idea of how long you've been on site, and what months you've been surveying in, before providing his advice.

Unfortunately we're not aware of a platypus expert in the Department. Gilad Bino from UNSW has been suggested as he has been leading some research and survey work around the state https://www.unsw.edu.au/staff/gilad-bino

Regards
Liz

Liz Mazzer
A/Senior Team Leader
Planning, North West

Biodiversity, Conservation and Science Directorate | Department of Planning and Environment
T 02 6883 5325 | **E** liz.mazzer@environment.nsw.gov.au
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From: Paul Rossington <prossington@emmconsulting.com.au>
Sent: Monday, 6 November 2023 3:52 PM
To: Liz Mazzer <Liz.Mazzer@environment.nsw.gov.au>
Cc: Alex Frolich <afrolich@emmconsulting.com.au>; Setter, Robert <Robert.Setter@energyaustralia.com.au>
Subject: Lake Lyell pumped hydro project (SSD-60598738) - Purple Copper Butterfly and Superb Parrot survey requirement clarification memos

Hi Liz,

It was good to meet you and thanks again for your time and offer of assistance with clarifying survey requirements.

Please find attached memos for the Purple Copper Butterfly and Superb Parrot.

I will send through memos for additional species as they are prepared.

If you or the relevant BCS accountable officers would like to discuss the contents of the memos please feel free to contact me.

Thank you

Paul

Paul Rossington
Associate Ecologist
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Paul Rossington

From: Ben Ellis <Ben.Ellis@environment.nsw.gov.au>
Sent: Monday, 5 February 2024 10:55 AM
To: Paul Rossington
Cc: Alex Frolich; Liz Mazzer
Subject: RE: Lake Lyell pumped hydro project (SSD-60598738) - Gang-gang Cockatoo survey requirement clarification memo
Attachments: E221111_Brush-tailed_Phascogale_Memo_BCD_v1.pdf

CAUTION: This email originated outside of the Organisation.

Hi Paul,

Lovely to chat.

Thanks for your patience whilst we look at the survey methods below, after finishing up the crazy Dec-Jan period.

As discussed, if you could provide a proposed camera array for the Brush-tailed Phascogale (inclusive of those detailed in Section 1.2 of the memo and any others to meet the total summarised in Section 1.3) I can take this to the AO for discussion. Spatial files of habitat, site boundary and proposed cameras would also be useful to expedite our response.

In the meantime I will work on separate response for your Glossy-black Cockatoo and Large Forest Owl memos, as a matter of priority.

Any queries please call or email.

Regards

Ben Ellis
Principal Project Officer (North West Region)
Biodiversity, Conservation & Science | Department of Climate Change, Energy, the Environment and Water
T 02 8275 1838 | **M** 0472 875 194 | **E** ben.ellis@environment.nsw.gov.au
dcceew.nsw.gov.au

NSW GOVERNMENT

From: Paul Rossington <prossington@emmconsulting.com.au>
Sent: Thursday, 11 January 2024 2:46 PM
To: Ben Ellis <Ben.Ellis@environment.nsw.gov.au>
Cc: Alex Frolich <afrolich@emmconsulting.com.au>; Setter, Robert <Robert.Setter@energyaustralia.com.au>
Subject: FW: Lake Lyell pumped hydro project (SSD-60598738) - Gang-gang Cockatoo survey requirement clarification memo

Hi Ben,

I hope you had a good end to 2023.

Appendix C

Targeted fauna survey dates and weather conditions

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C.1 Targeted fauna survey dates and weather conditions

Survey date ranges and weather conditions of relevance to the species targeted are included in the tables below.

Table C.1 Bat survey dates and temperate ranges

Date range	Techniques	Minimum temperature range during surveys (degrees Celsius)	Maximum temperature range during surveys (degrees Celsius)
13/11/2023-16/11/2023	Anabat	2.9 – 11.2	26.7 – 28.5
29/11/2023-15/12/2023	Anabat	5.0 – 16.9	20.5 – 34.4
21/01/2025-28/01/2025	Anabat	8.0 – 16.9	17.7 – 34.3

Table C.3 Reptile survey dates and temperate ranges

Date range	Techniques	Minimum temperature range during surveys	Maximum temperature range during surveys (degrees Celsius)
18/10/2023-19/10/2023	Reptile active search	(12 degrees recorded during survey) 6.8 – 7.7	(21 recorded during survey) 16.3 – 22.0
13/11/2023-16/11/2023	Reptile active search	(12 degrees recorded during survey) 5.1 – 11.2	(22 recorded during survey) 27.0 – 28.5
27/11/2023	Reptile active search	6.3	(25 recorded during survey) 28.0
30/11/2023	Reptile active search	10.9	20.5
04/12/2023 – 07/12/2023	Reptile active search	8.3 – 12.4	25.1 – 33.0
13/12/2023-14/12/2023	Reptile active search	10.7 – 16.4	30.9 – 31.1

Table C.4 Mammal survey dates and temperate ranges

Date range	Techniques	Minimum temperature range during surveys	Maximum temperature range during surveys (degrees Celsius)
31/05/2023-06/07/2023	Remote cameras	-9.6 – 8.8	6.2 – 19.2
14/06/2023-06/07/2023	Koala song meter	-9.6 – 8.8	6.2 – 14.4
14/11/2023-15/11/2023	Spotlighting	6.9 – 11.2	27.0 – 28.5
27/11/2023-30/11/2023	Spotlighting	6.3 – 14.8	20.5 – 28.0
28/11/2023-07/03/2024	Remote cameras	5.0 – 19.8	15.8 – 34.4
04/12/2023-06/12/2023	Spotlighting	8.3 – 12.4	25.1 – 33.0
11/12/2023-12/12/2023	Spotlighting	12.4 – 15.9	27.4 – 31.8
07/03/2023-25/03/2024	Remote cameras	3.4 – 15.3	15.6 – 29.4

Table C.5 Bird survey dates and temperate ranges

Date range	Techniques	Minimum temperature range during surveys	Maximum temperature range during surveys (degrees Celsius)
04/07/2023-06/07/2023	Area searches (Glossy Black Cockatoo)	-1.2 – 8.8	8.4 – 14.2
04/07/2023-06/07/2023	Owl broadcast survey	-1.2 – 8.8	8.4 – 14.2
05/07/2023	Stag watch	8.8	14.2
24/07/2023-27/07/2023	Owl passive listening	-6.5 – -2.3	13.5 – 16.3
24/07/2023-27/07/2023	Stag watch	-6.5 – -2.3	13.5 – 16.3
08/08/2023-10/08/2023	Area searches (Glossy Black Cockatoo)	-1.1 – -0.3	15.6 – 16.8
08/08/2023-10/08/2023	Stag watch	-1.1 – -0.3	15.6 – 16.8
28/11/2023-29/11/2023	Vantage point survey	-3.1 – 0	17.3 – 18.6
13/11/2023-15/11/2023	Area searches and vantage point surveys	2.9 – 11.2	26.7 – 28.5
15/11/2023	Bird transects	11.2	27.0
04/12/2023-06/12/2023	Area searches and vantage point surveys	8.3 – 12.4	25.1 – 33.0
5/12/2023-7/12/2023	Bird transects	8.3 – 12.4	30.8 – 33.0
12/12/2023	Vantage point survey	15.9	27.4
16/01/2024-17/01/2024	Area searches and bird transects	13.0 – 13.2	20.7 – 23.2

Table C.6 Amphibian survey dates and temperate ranges

Date range	Techniques	Minimum temperature range during surveys	Maximum temperature range during surveys (degrees Celsius)
11/12/2023	Opportunistic frog survey	12.4	31.8

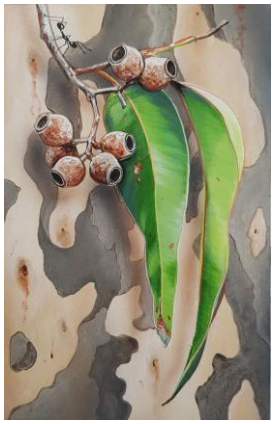
Table C.7 Invertebrate survey dates and temperate ranges

Date range	Techniques	Minimum temperature range during surveys	Maximum temperature range during surveys (degrees Celsius)
18/09/2023 – 22/09/2023	Purple Copper Butterfly survey	1.0 – 10.9	14.4 – 27.9
03/10/2023 – 06/10/2023	Purple Copper Butterfly survey	-0.6 – 17.0	13.9 – 28.4
18/10/2023 – 20/10/2023	Purple Copper Butterfly survey	4.7 – 12.4	16.3 – 25.1

Appendix D

Ultrasonic bat call analysis results

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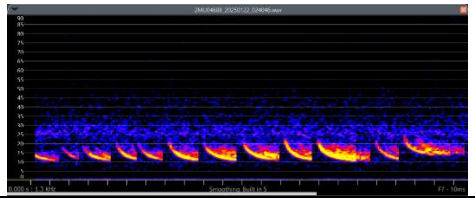
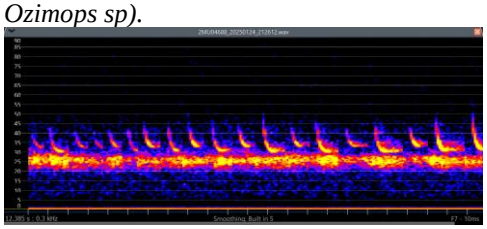
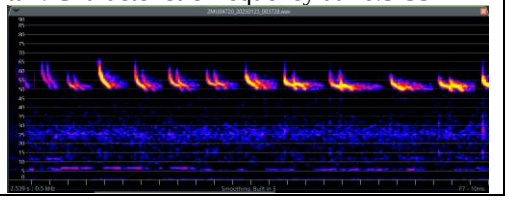


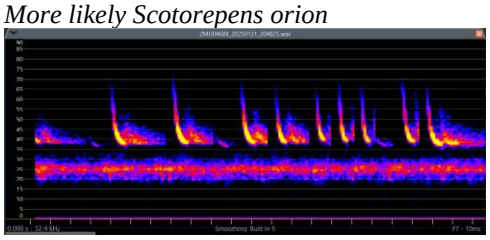
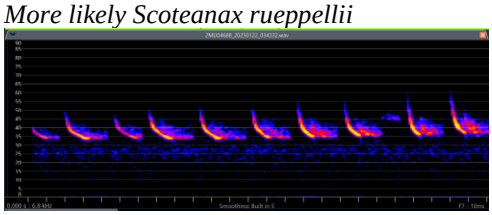
CORYMBIA ECOLOGY

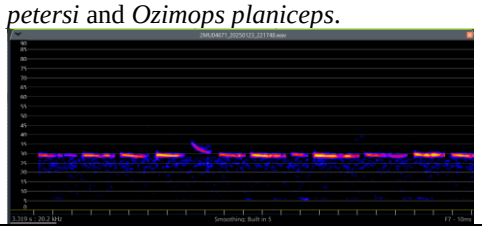
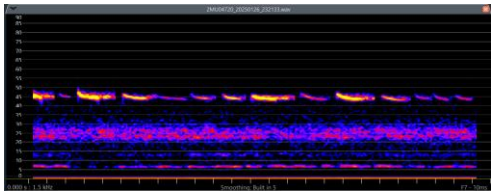
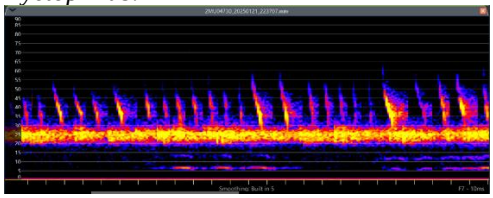
Amy Rowles
415 Parishs Rd, Hilldale, NSW, 2420
Mob: 0418451488
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ABN 61854031078

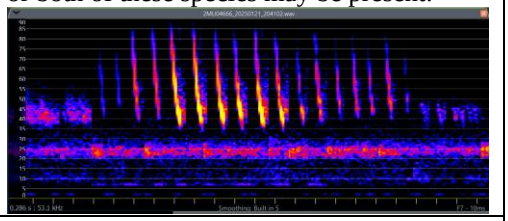
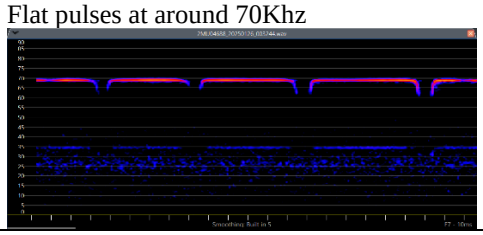
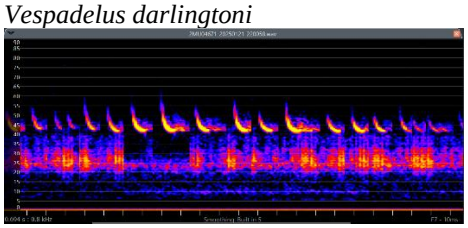
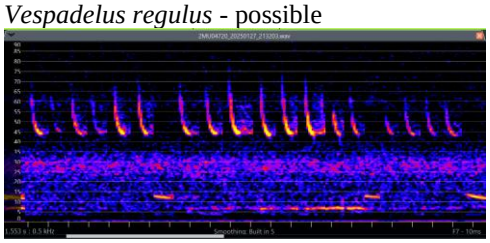
BAT CALL ANALYSIS RESULTS

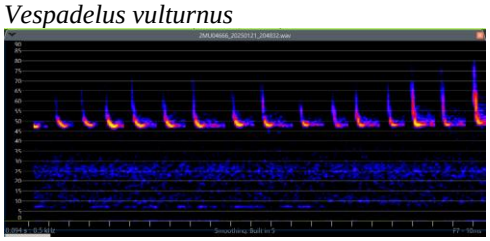
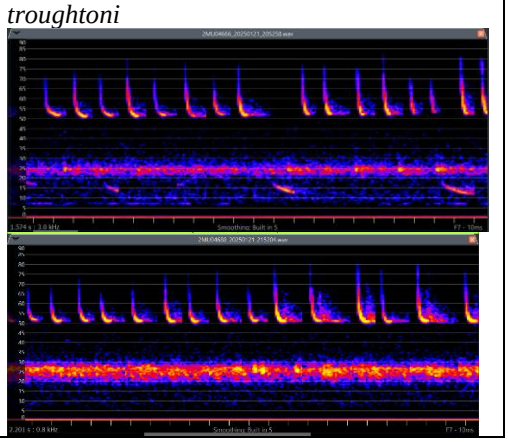
EMM: Lake Lyell, 21-28/1/25

Unit number	**4666**	**4670**	**4671**	**4688**	**4720**	**4730**	**Notes** **Activity levels are relative to the overall activity levels recorded in this data set.**
Date/s of recordings	21/1	21-28/1	21-28/1	21-26/1	21-27/1	21-28/1	
Total number of files	367	11369	11229	5135	11017	11102	
Noise files	122	2936	3560	1201	2587	2518	
Species							
Austronomus australis	D	D	D	D	D	D	**Moderate activity.** Flat to curved pulse characteristic frequency at 10-15khz. 
Chalinolobus gouldi	D	D	D	D	D	D	**Moderate activity levels.** Usually curved, upright pulses with a prominent foot with no tail. May sometimes downsweep and be flatter at the lower frequencies in more open areas. Alternation is present in many passes which distinguish the species from others calling at the same frequency (i.e. *Scotorepens balstoni* and *Ozimops sp).* 
Chalinolobus morio	D	D	D	D	D	D	**Low-moderate activity** Curved upright call with a downsweeping tail. Characteristic frequency at 46.5-53khz 

Unit number	**4666**	**4670**	**4671**	**4688**	**4720**	**4730**	**Notes** **Activity levels are relative to the overall activity levels recorded in this data set.**
Date/s of recordings	21/1	21-28/1	21-28/1	21-26/1	21-27/1	21-28/1	
Total number of files	367	11369	11229	5135	11017	11102	
Noise files	122	2936	3560	1201	2587	2518	
Species							
Falsistrellus tasmaniensis / Scotorepens orion / Scoteanax rueppellii	ScOr	E	E	E	E	E	**Low activity.** Probable *Scotorepens orion* and possible *Scoteanax rueppellii*. Also a chance of *Scotorepens balstoni* or *Falsistrellus tasmaniensis*. Characteristic frequency of *Scotorepens orion* is 34.5-37.5khz, with a curved pulse shape with absent or downsweeping tail. *Scoteanax rueppellii* has a curved pulse with characteristic frequency 32-36.5. Often with a long pre-characteristic section. And the frequency of knee is usually higher than 37khz. *More likely Scotorepens orion*  *More likely Scoteanax rueppellii*  *Falsistrellus tasmaniensis* has a curved pulse with characteristic frequency of 35-39khz. Often with a long pre-characteristic section, but can also be steep. No tail or occasionally downsweeping. Overlap in call characteristics between these species results in difficulty identifying to species.
Ozimops planiceps					Po (1 pass)	Po (1pass)	**Very low activity.** Characteristic frequency 26-30.5khz. Flat to curved pulses. This pulse is dominant harmonic, with second between 53-60 – usually only visible in full spectrum. Can differentiate from non-alternating cruise phase *Chalinolobus gouldii* if the pass contains harmonics as *C. gouldii* does not appear to display harmonics. May be confused with *Ozimops petersi* and *Ozimops ridei* at the higher frequencies where there is overlap in call characteristics and where there is an overlap in distribution.
Ozimops ridei	D	D	D	D	D	D	**Low to moderate activity.** Characteristic frequency 28.5 to 31khz. Usually flat pulses, but also curved in attack phase. During attack phase this species can

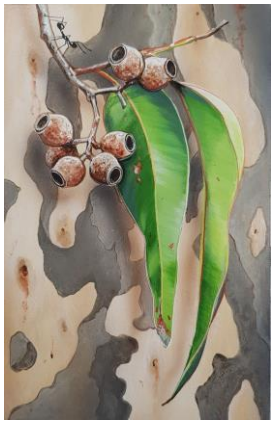
Unit number	**4666**	**4670**	**4671**	**4688**	**4720**	**4730**	**Notes** **Activity levels are relative to the overall activity levels recorded in this data set.**
Date/s of recordings	21/1	21-28/1	21-28/1	21-26/1	21-27/1	21-28/1	
Total number of files	367	11369	11229	5135	11017	11102	
Noise files	122	2936	3560	1201	2587	2518	
Species							
							produce pulses that may be confused with other species calling in the same frequency range. Where distribution overlap this species may be confused with *Ozimops petersi* and *Ozimops planiceps*. 
Miniopterus orianae oceanensis	Pr		D	D	D	D	**Low activity.** Characteristic frequency 43-48khz. The passes at the mid to lower frequencies often have a relatively short initial section, with a fairly long characteristic section with no tail or down sweeping tail. Consecutive pulses in a sequence are often irregular with varying shape and frequency. There is considerable overlap with *Vespadelus sp* and some passes may not be confidently distinguishable. A more prominent down sweep tail helps to identify from *Vespadelus sp*. The higher frequency pulses, particularly in clutter or roost entrances are steeper with a longer initial section, shorter characteristic section, often down sweeping tail. These sequences may be confused with *Chalinolobus morio* . 
Myotis macropus	D-low	D - low	D-mod	Po- a couple of passes that could either be Myotis or Nyctophilus	D - high	D-high	**Definite calls with varying activity levels at all sites except 4688**. *Myotis macropus* calls are very similar to *Nyctophilus* species and often cannot be distinguished. Good Myotis passes are often longer and stronger than *Nyctophilus* with a varying slope between consecutive pulses and often occur at a slightly lower frequency than *Nyctophilus*. 

Unit number	**4666**	**4670**	**4671**	**4688**	**4720**	**4730**	**Notes** **Activity levels are relative to the overall activity levels recorded in this data set.**
Date/s of recordings	21/1	21-28/1	21-28/1	21-26/1	21-27/1	21-28/1	
Total number of files	367	11369	11229	5135	11017	11102	
Noise files	122	2936	3560	1201	2587	2518	
Species							
Nyctophilus geoffroyi /N. gouldi	D-E	D-E	D-E	D-E	D-E	Pr-E	**Low activity recorded at most sites, except for 4688 which had moderate activity.** Near vertical pulse shape. *Nyctophilus* species currently indistinguishable on call characteristics One or both of these species may be present. 
Rhinolophus megaphyllus			D- 1 pass	D- 1 pass	D – 1 pass		**Very low activity.** Flat pulses at around 70Khz 
Vespadelus darlingtoni	D	D	D	D	D	D	**Very high activity levels.** Characteristic frequency for *V. darlingtoni* is 38-46khz. Curved pulse often upsweeping or absent with a fairly long characteristic section. Overlap with *Miniopterus orianae oceanensis*, but can be distinguished by having a lack of downsweeping tail and consistent consecutive pulses *Vespadelus darlingtoni.* Overlap in call characteristics with *Vespadelus regulus*. It is likely that calls of both species were recorded. Characteristic frequency for *Vespadelus regulus* is 40-55khz, where this frequency and call shape varies geographically. *Vespadelus darlingtoni*  *Vespadelus regulus* - possible 
Vespadelus regulus	Po	Po	Po	Po	Po	Pr	

Unit number	**4666**	**4670**	**4671**	**4688**	**4720**	**4730**	**Notes** **Activity levels are relative to the overall activity levels recorded in this data set.**
Date/s of recordings	21/1	21-28/1	21-28/1	21-26/1	21-27/1	21-28/1	
Total number of files	367	11369	11229	5135	11017	11102	
Noise files	122	2936	3560	1201	2587	2518	
Species							
Vespadelus vulturnus / Vespadelus troughtoni	E	E	E	E	E	E	**Moderate activity levels.** *Vespadelus* passes at 48-52khz. Most likely *V. vulturnus*, but passes cannot be confidently distinguished from *V. troughtoni*. Characteristic frequency for *V. troughtoni* 49-53.5khz. *Vespadelus vulturnus*  Either *Vespadelus vulturnus* or *Vespadelus troughtoni* 

Note: only calls identified as definite should be entered in Bionet

- D – definite; Pr – probable; Po – possible; E-either or both.
- Calls were analysed using Anabat Insight.
- Example calls presented below are displayed in this report at F7.
- Analysis was completed on the 31 March 2024
- The following resources were consulted during analysis:
    - Pennay M., Law B., and Reinhold L. (2004) Bat Calls of NSW. DEC of NSW.
    - Corben C. (2009) Anabat Techniques Workshop, Titley Scientific.
    - Personal experience analysing calls and collection of reference calls in NSW
    - Anabat Insight Workshop (2019), Titley Scientific and Balance Environmental.

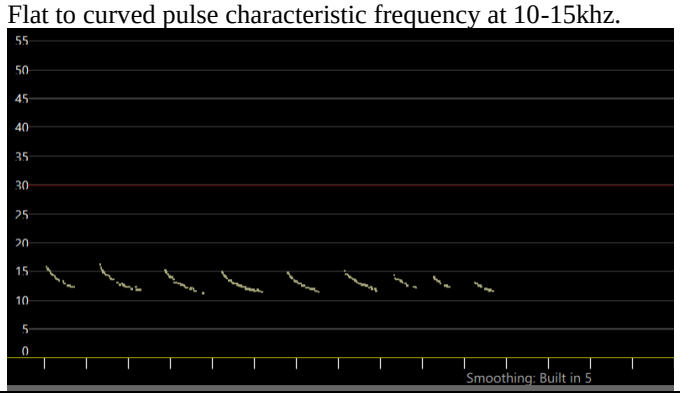
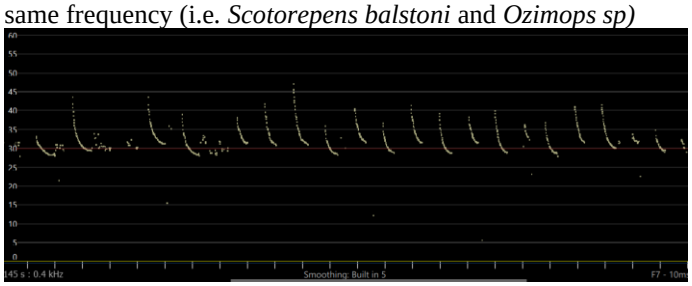


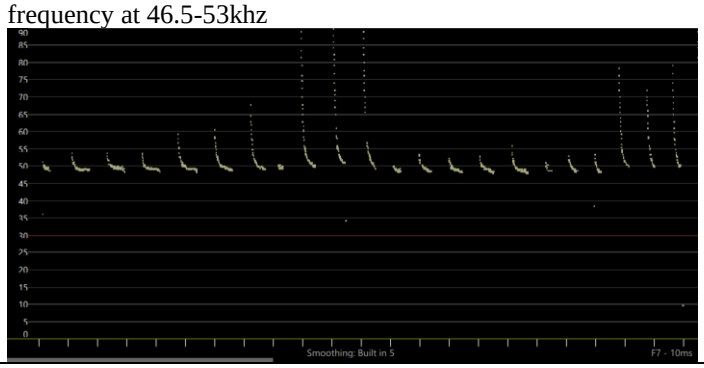
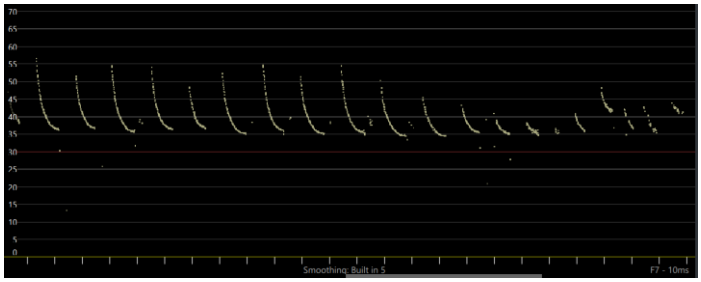
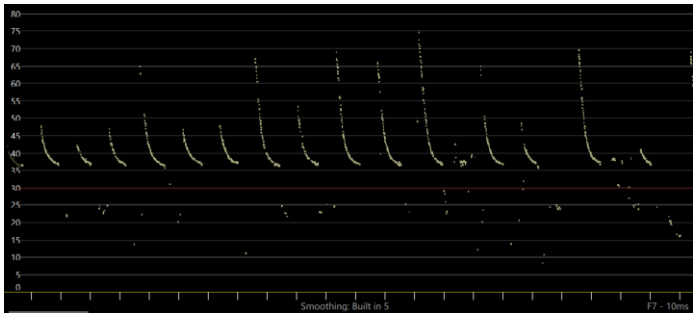
CORYMBIA ECOLOGY

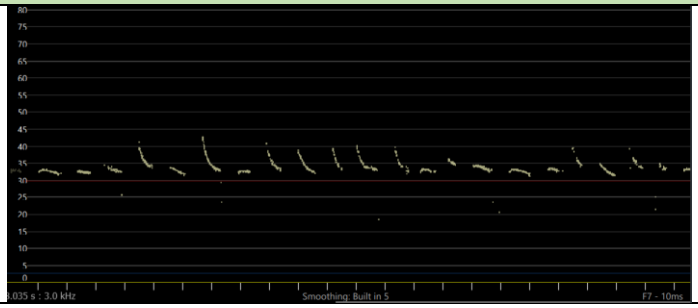
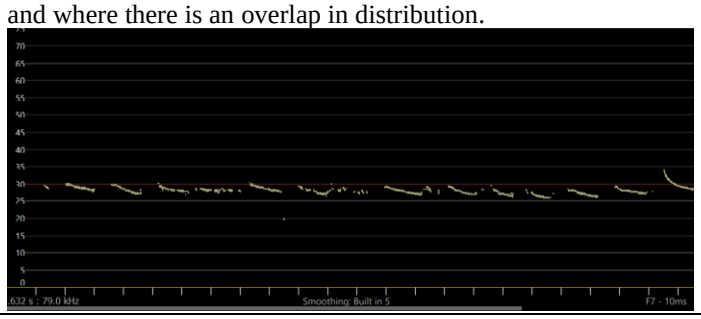
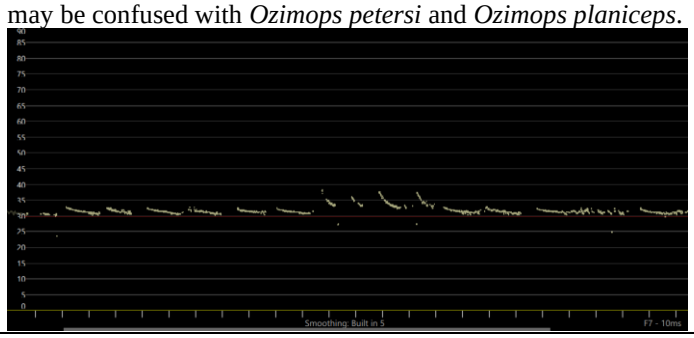
Amy Rowles
415 Parishs Rd, Hilldale, NSW, 2420
Mob: 0418451488
Email: amy@corymbiaecology.com.au
ABN 61854031078

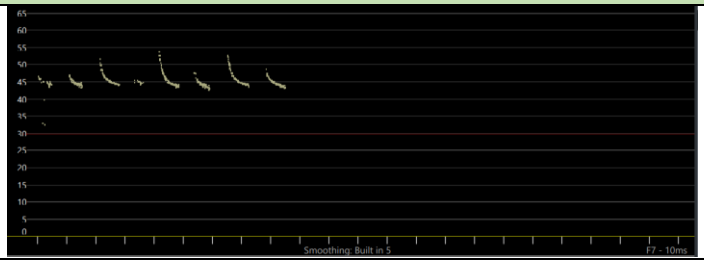
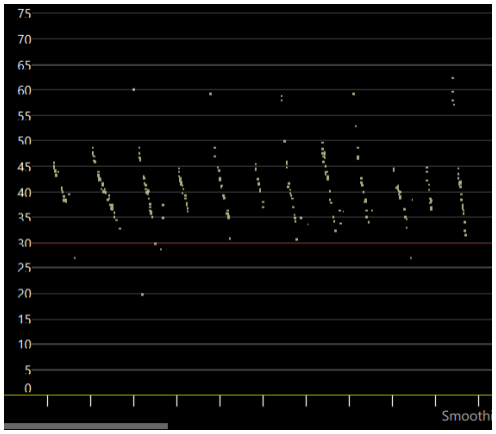
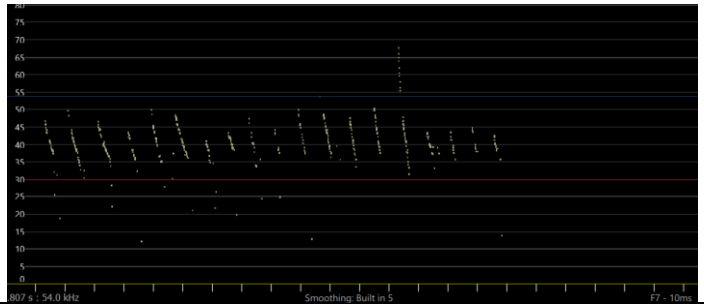
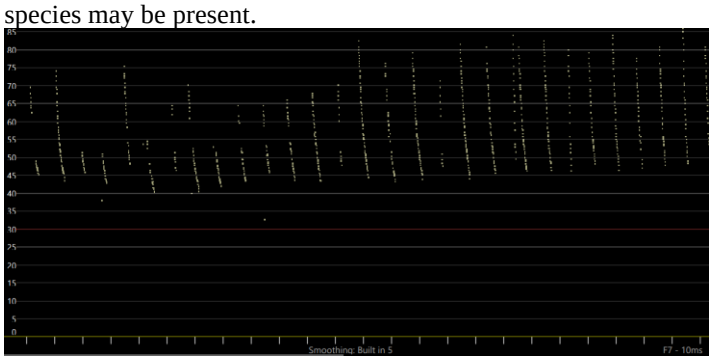
BAT CALL ANALYSIS RESULTS

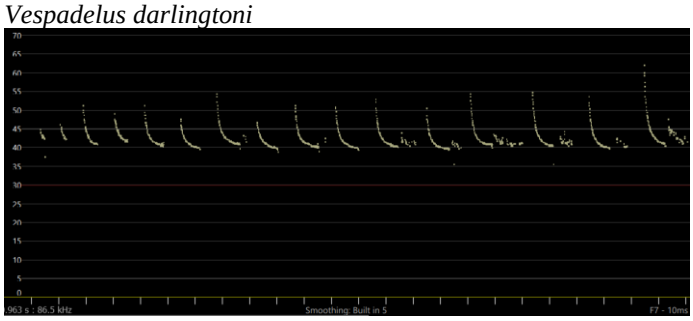
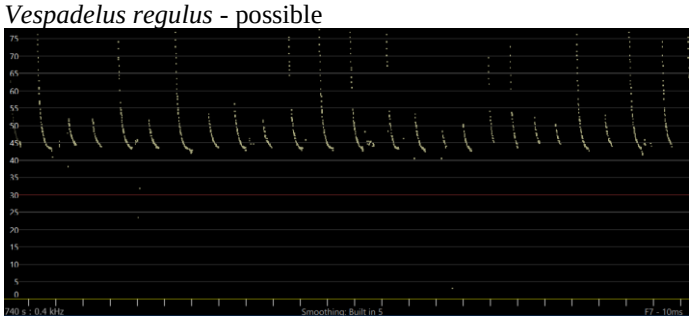
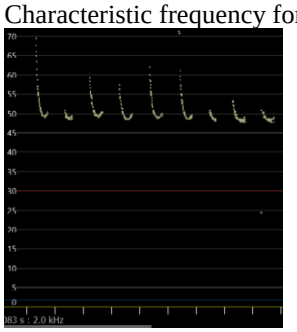
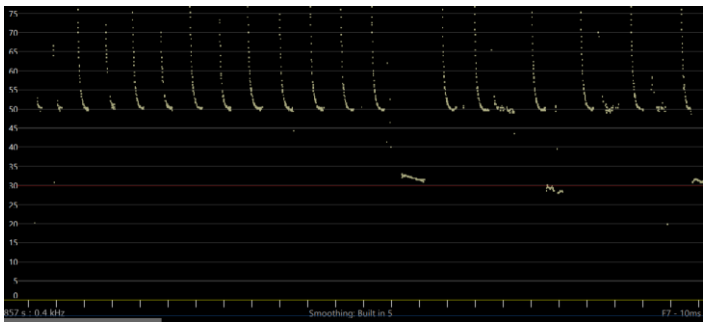
EMM: Lake Lyell, 13/11/23-14/12/2024
46794 files

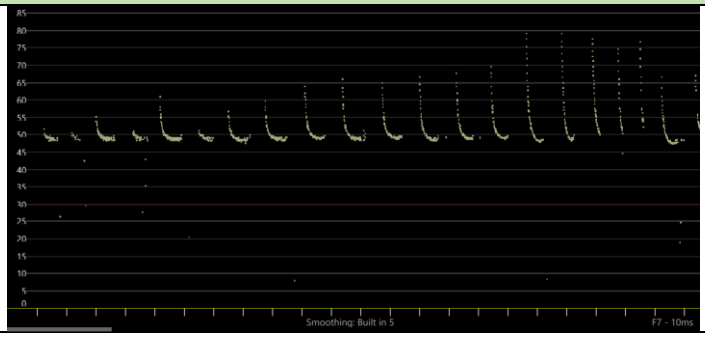
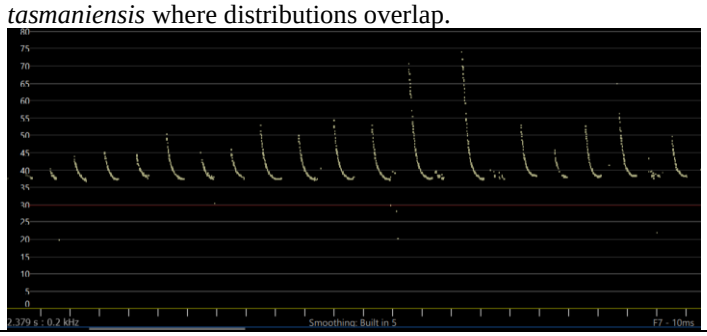
Species	**Species ID confidence**	**Notes** A1-13-16/11/23 A2- 13-16/11/23 A4- 13-20/11/23 A1-2- 27/11-13/12/23 A2-2-27/11-13/12/23 A4-2- 30/11-14/12/23
Austronomus australis	D. relatively high activity.	Flat to curved pulse characteristic frequency at 10-15khz. 
Chalinolobus gouldi	D	Usually curved, upright pulses with a prominent foot with no tail. May sometimes downsweep and be flatter at the lower frequencies in more open areas. Alternation is present in many passes which distinguish the species from others calling at the same frequency (i.e. *Scotorepens balstoni* and *Ozimops sp)* 

Species	**Species ID confidence**	**Notes** A1-13-16/11/23 A2- 13-16/11/23 A4- 13-20/11/23 A1-2- 27/11-13/12/23 A2-2-27/11-13/12/23 A4-2- 30/11-14/12/23
Chalinolobus morio	D	Curved upright call with a downsweeping tail. Characteristic frequency at 46.5-53khz 
Falsistrellus tasmaniensis / Scotorepens orion / Scoteanax rueppellii	E - passes that contain characteristics of all three species were recorded.	Characteristic frequency of *Scotorepens orion* is 34.5-37.5khz, with a curved pulse shape with absent or downsweeping tail. *Scoteanax rueppellii* has a curved pulse with characteristic frequency 32-36.5. Often with a long pre-characteristic section. And the frequency of knee is usually higher than 37khz. *Falsistrellus tasmaniensis* has a curved pulse with characteristic frequency of 35-39khz. Often with a long pre-characteristic section, but can also be steep. No tail or occasionally downsweeping. Overlap in call characteristics between these species results in difficulty identifying to species.  
Micronomus norfolkensis	A1 – Pr – one pass A1-2 – D – one pass A4-2 – Pr – two pass	Characteristic frequency 31-35khz. The Characteristic pulses of this species are easily identifiable with alternating flat calls, often with a very short initial section and a down sweeping tail. However, this species displays a wide variety of pulse shapes and sequences, with some segments resembling other species that call in the 35khz range. Non-alternating, distinctive passes could be confused with *Ozimops ridei* or *Ozimops petersi* where distributions overlap.

Species	**Species ID confidence**	**Notes** A1-13-16/11/23 A2- 13-16/11/23 A4- 13-20/11/23 A1-2- 27/11-13/12/23 A2-2-27/11-13/12/23 A4-2- 30/11-14/12/23
		
Ozimops planiceps	Pr	Characteristic frequency 26-30.5khz. Flat to curved pulses. This pulse is dominant harmonic, with second between 53-60 – usually only visible in full spectrum. Can differentiate from non-alternating cruise phase *Chalinolobus gouldii* if the pass contains harmonics as *C. gouldii* does not appear to display harmonics. May be confused with *Ozimops petersi* and *Ozimops ridei* at the higher frequencies where there is overlap in call characteristics and where there is an overlap in distribution. 
Ozimops ridei	Pr	Characteristic frequency 28.5 to 31khz. Usually flat pulses, but also curved in attack phase. During attack phase this species can produce pulses that may be confused with other species calling in the same frequency range. Where distribution overlap this species may be confused with *Ozimops petersi* and *Ozimops planiceps*. 
Miniopterus orianae oceanensis	A1, A2, A4, A1-2- Pr A3-2, A4-2- D	Characteristic frequency 43-48khz. The passes at the mid to lower frequencies often have a relatively short initial section, with a fairly long characteristic section with no tail or down sweeping tail. Consecutive pulses in a sequence are often irregular with varying shape and frequency. There is considerable overlap with *Vespadelus sp* and some passes may not be confidently distinguishable. A more prominent down sweep tail helps to identify from *Vespadelus sp*. The higher frequency pulses, particularly in clutter or roost entrances are steeper with a longer initial section, shorter characteristic section, often down sweeping tail. These sequences may be confused with *Chalinolobus morio* .

Species	**Species ID confidence**	**Notes** A1-13-16/11/23 A2- 13-16/11/23 A4- 13-20/11/23 A1-2- 27/11-13/12/23 A2-2-27/11-13/12/23 A4-2- 30/11-14/12/23
		
Myotis macropus	A1-(4 passes); A2-(1 pass) that could either be *Nyctophilus*, a steep freetail bat or Myotis A1-4 (130 passes) *Nyctophilus* or *Myotis* A3-2 – 9 passes *Nyctophilus* or *Myotis* A4-2 – 60 possible passes that do contain characteristics of *Myotis* passes, however I am not able to give a more positive identification. Either these bats are *Myotis* and they are foraging at a distance from the detector or may be social calls of another species or steep calls of a freetail bat. As the detector was positioned over water it is recommended that the presence of Myotis be investigated further.	*Myotis macropus* calls are very similar to *Nyctophilus* species and often cannot be distinguished. Good Myotis passes are often longer and stronger than *Nyctophilus* with a varying slope between consecutive pulses and often occur at a slightly lower frequency than *Nyctophilus*. Passes recorded atA4-2  
Nyctophilus geoffroyi /N. gouldi	E	Near vertical pulse shape. *Nyctophilus* species currently indistinguishable on call characteristics One or more of these species may be present. 

Species	**Species ID confidence**	**Notes** A1-13-16/11/23 A2- 13-16/11/23 A4- 13-20/11/23 A1-2- 27/11-13/12/23 A2-2-27/11-13/12/23 A4-2- 30/11-14/12/23
Vespadelus darlingtoni	D – extremely high activity from this species	Overlap in call characteristics between these *Vespadelus* species make identification of many calls not possible. It is likely that calls of all three species were recorded. Characteristic frequency for *Vespadelus regulus* is 40-55khz, where this frequency and call shape varies geographically. Characteristic frequency for *V. darlingtoni* is 38-46khz. Curved pulse often upsweeping or absent with a fairly long characteristic section. Overlap with *Miniopterus orianae oceanensis*, but can be distinguished by having a lack of downsweeping tail and consistent consecutive pulses *Vespadelus darlingtoni*  *Vespadelus regulus* - possible 
Vespadelus regulus	Po – overlap with *V. darlingtoni* makes identification of this species difficult.	
Vespadelus vulturnus / Vespadelus troughtoni	A1-E, A2-E A3-2 - E A4-2- E A4 – E A few passes of *Vespadelus* at this frequency range. If suitable rock outcrop habitat occurs in the vicinity, the possible presence of *V. troughtoni* should be considered.	*Vespadelus* passes at 48.5-50khz. Most likely *V. vulturnus*, but the pass cannot be confidently distinguished from *V. troughtoni*. Characteristic frequency for *V. troughtoni* 49-53.5khz  

Species	**Species ID confidence**	**Notes** A1-13-16/11/23 A2- 13-16/11/23 A4- 13-20/11/23 A1-2- 27/11-13/12/23 A2-2-27/11-13/12/23 A4-2- 30/11-14/12/23
		
Scotorepens greyii	Pr	Characteristic frequency 35-40kh. Curved pulse shape, usually with upsweeping tail. May also have down sweeping or absent tail and when this occurs it is difficult to separate from *Scotorepens orion*. Also overlaps with *Chalinolobus nigrogriseus*, non-alternating *Chalinolobus picatus* and possible *Falsistrellus tasmaniensis* where distributions overlap. 

Note: only calls identified as definite should be entered in Bionet

- D – definite; Pr – probable; Po – possible; E-either or both.
- Calls were analysed using Anabat Insight.
- Example calls presented below are displayed in this report at F7.
- Analysis was completed on the 11 April 2024
- The following resources were consulted during analysis:
    - Pennay M., Law B., and Reinhold L. (2004) Bat Calls of NSW. DEC of NSW.
    - Corben C. (2009) Anabat Techniques Workshop, Titley Scientific.
    - Personal experience analysing calls and collection of reference calls in NSW
    - Anabat Insight Workshop (2019), Titley Scientific and Balance Environmental.

Appendix E
BAM credit report

EMM
creating opportunities

BAM Credit Summary Report

Proposal Details

Assessment Id
00042031/BAAS18065/23/00042047

Proposal Name
Lake Lyell PHES - area of the Early Works in the Bathurst IBRA subregion

BAM data last updated *
05/08/2025

Assessor Name
Paul A Rossington

Report Created
30/01/2026

BAM Data version *
Current classification (live - default) (82)

Assessor Number
BAAS18065

BAM Case Status
Finalised

Date Finalised
30/01/2026

Assessment Revision
4

BOS entry trigger

Assessment Type
Major Projects

* 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
Central Tableland Granites Grassy Box Woodland												
7	3367_DEGH	Not a TEC	10.6	10.6	1.3	PCT Cleared - 78%	High Sensitivity to Gain			2.00		0

8	3367_DNG_Poor	Not a TEC	18.1	18.1	10.9	PCT Cleared - 78%	Low Sensitivity to Gain			1.50		0
10	3367_Moderate	Not a TEC	60.8	60.8	0.11	PCT Cleared - 78%	High Sensitivity to Gain			2.00		3
											Subtotal	**3**
Goulburn-Lithgow Ranges Silvertop Ash Forest												
9	3650_Moderate	Not a TEC	82.4	82.4	0.05	PCT Cleared - 6%	High Sensitivity to Gain			1.50		2
											Subtotal	**2**
Southern Tableland Creekflat Ribbon Gum Forest												
1	3347_Sedge	Not a TEC	13.8	13.8	0.75	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
											Subtotal	**0**
Southern Tableland Granites Ribbon Gum Grassy Forest												
2	3348_DEGH	Not a TEC	10.5	10.5	3	PCT Cleared - 82%	High Sensitivity to Gain			2.00		0
3	3348_DNG	Not a TEC	31.4	31.4	0.13	PCT Cleared - 82%	High Sensitivity to Gain			2.00		2

4	3348_Exotic	Not a TEC	8.4	8.4	0.17	PCT Cleared - 82%	High Sensitivity to Gain			2.00		0
5	3348_Moderate	Not a TEC	72.8	72.8	2.9	PCT Cleared - 82%	High Sensitivity to Gain			2.00		107
6	3348_Poor	Not a TEC	23.4	23.4	0.36	PCT Cleared - 82%	High Sensitivity to Gain			2.00		4
											Subtotal	**113**
											Total	**118**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Myotis macropus / Southern Myotis (Fauna)									
3348_Moderate	72.8	72.8	0.99	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	36
3348_Poor	23.4	23.4	0.15	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2

3650_Moderate	82.4	82.4	0.05	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	2
								Subtotal	**40**
Paralucia spinifera / Purple Copper Butterfly, Bathurst Copper Butterfly (Fauna)									
3348_DNG	31.4	31.4	0.02	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	1
3348_Moderate	72.8	72.8	0.08	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	3
								Subtotal	**4**
Phascolarctos cinereus / Koala (Fauna)									
3348_Moderate	72.8	72.8	2.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	107
3348_Poor	23.4	23.4	0.36	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	4

3650_Moderate	82.4	82.4	0.05	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	2
3367_Moderate	60.8	60.8	0.11	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	3
								Subtotal	**116**

BAM Credit Summary Report

Proposal Details

Assessment Id

00042031/BAAS18065/25/00059369

Proposal Name

Lake Lyell PHES Early Works area in the Hill End subregion of the South East Highlands IBRA region

BAM data last updated *

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Assessor Name

Paul A Rossington

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Assessment Revision

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BOS entry trigger

Assessment Type

Major Projects

* 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

Central Tableland Granites Grassy Box Woodland											
4	3367_DS	Not a TEC	59.8	59.8	0.1	PCT Cleared - 78%	High Sensitivity to Gain			2.00		3
5	3367_Moderate	Not a TEC	86.1	86.1	1.5	PCT Cleared - 78%	High Sensitivity to Gain			2.00		65
6	3367_Poor	Not a TEC	79.5	79.5	0.17	PCT Cleared - 78%	High Sensitivity to Gain			2.00		7
											Subtotal	**75**
Central Tableland Montane Wet Forest											
1	3211_Moderate	Not a TEC	76.4	76.4	0.48	PCT Cleared - 21%	High Sensitivity to Gain			1.50		14
											Subtotal	**14**
Central Tableland Peppermint Shrub-Grass Forest											
9	3735_High	Not a TEC	93.9	93.9	2.2	PCT Cleared - 69%	High Sensitivity to Gain			1.75		92
											Subtotal	**92**

Central Tableland Ranges Peppermint-Gum Grassy Forest												
7	3369_Moderate	Not a TEC	97.6	97.6	1.2	PCT Cleared - 62%	High Sensitivity to Gain			1.75		51
											Subtotal	**51**
Goulburn-Lithgow Ranges Silvertop Ash Forest												
8	3650_High	Not a TEC	81.4	81.4	0.19	PCT Cleared - 6%	High Sensitivity to Gain			1.50		6
											Subtotal	**6**
Southern Tableland Creekflat Ribbon Gum Forest												
2	3347_DEGH	Not a TEC	9.1	9.1	0.32	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
											Subtotal	**0**
Southern Tableland Granites Ribbon Gum Grassy Forest												
3	3348_Moderate	Not a TEC	64.9	64.9	0.18	PCT Cleared - 82%	High Sensitivity to Gain			2.00		6
											Subtotal	**6**

Southern Tableland Western Hills Scribbly Gum Forest											
10	3747_High	Not a TEC	89.4	89.4	1	PCT Cleared - 65%	High Sensitivity to Gain			1.75	41
										Subtotal	**41**
										Total	**285**

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
Callocephalon fimbriatum / Gang-gang Cockatoo (Fauna)									
3747_High	89.4	89.4	1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	46
3735_High	93.9	93.9	0.98	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	46
3650_High	81.4	81.4	0.14	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	6

3369_Moderate	97.6	97.6	0.64	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	31
3211_Moderate	76.4	76.4	0.22	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	8
								Subtotal	**137**
Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo (Fauna)									
3735_High	93.9	93.9	0.06	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	3
3369_Moderate	97.6	97.6	0.02	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	1
								Subtotal	**4**
Myotis macropus / Southern Myotis (Fauna)									
3747_High	89.4	89.4	0.24	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	11
3735_High	93.9	93.9	0.89	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	42

3367_Moderate	86.1	86.1	0.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	13
3348_Moderate	64.9	64.9	0.18	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	6
3369_Moderate	97.6	97.6	0.46	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	22
3367_Poor	79.5	79.5	0.12	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	5
								Subtotal	**99**
Ninox strenua / Powerful Owl (Fauna)									
3747_High	89.4	89.4	1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	47
3735_High	93.9	93.9	1.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	81

3650_High	81.4	81.4	0.19	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	8
3367_Moderate	86.1	86.1	0.01	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1
3369_Moderate	97.6	97.6	1.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	59
3211_Moderate	76.4	76.4	0.48	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	18
								Subtotal	**214**
Paralucia spinifera / Purple Copper Butterfly, Bathurst Copper Butterfly (Fauna)									
3367_DS	59.8	59.8	0.08	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	2
3747_High	89.4	89.4	0.21	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	9

3735_High	93.9	93.9	0.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	5
3650_High	81.4	81.4	0.14	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	6
3367_Moderate	86.1	86.1	0.21	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	9
3348_Moderate	64.9	64.9	0.08	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	3
								Subtotal	**34**
Phascolarctos cinereus / Koala (Fauna)									
3747_High	89.4	89.4	1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	47

3735_High	93.9	93.9	2.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	105
3650_High	81.4	81.4	0.19	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	8
3367_Moderate	86.1	86.1	1.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	65
3348_Moderate	64.9	64.9	0.18	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	6
3369_Moderate	97.6	97.6	1.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	59
3211_Moderate	76.4	76.4	0.48	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	18

3367_Poor	79.5	79.5	0.17	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	7
								Subtotal	**315**
Tyto tenebricosa / Sooty Owl (Fauna)									
3735_High	93.9	93.9	1.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	121
3650_High	81.4	81.4	0.19	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	12
3369_Moderate	97.6	97.6	1.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	88
3211_Moderate	76.4	76.4	0.48	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	28
								Subtotal	**249**

BAM Credit Summary Report

Proposal Details

Assessment Id
00042031/BAAS18065/25/00056149

Proposal Name
Lake Lyell PHES - Pottery Estate construction camp site in Burragorang IBRA subregion

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Assessment Revision
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BOS entry trigger

Assessment Type
Major Projects

* 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

Newnes Plateau Peppermint-Ash Tall Forest											
4	3687_DEGH	Not a TEC	13.1	13.1	6	PCT Cleared - 3%	High Sensitivity to Gain			1.50		0
											Subtotal	**0**
Southern Tableland Creekflat Swamp Woodland											
1	3385_Poor	Not a TEC	38.5	38.5	0.36	PCT Cleared - 75%	High Sensitivity to Gain			2.00		7
2	3385_DNG	Not a TEC	29.6	29.6	0.25	PCT Cleared - 75%	High Sensitivity to Gain			2.00		4
3	3385_DEGH	Not a TEC	7.2	7.2	2.1	PCT Cleared - 75%	High Sensitivity to Gain			2.00		0
											Subtotal	**11**
											Total	**11**

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

BAM Credit Summary Report

Proposal Details

Assessment Id
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Proposal Name
Lake Lyell Pumped Hydro Energy Storage BDAR - Early Works Pottery Estate site in the Wollemi IBRA subregion

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BOS entry trigger

Assessment Type
Major Projects

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

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Newnes Plateau Peppermint-Ash Tall Forest											
1	3687_Poor	Not a TEC	26.1	26.1	0.05	PCT Cleared - 3%	High Sensitivity to Gain			1.50	1
2	3687_DNG_Poor	Not a TEC	20.4	20.4	0.03	PCT Cleared - 3%	High Sensitivity to Gain			1.50	1
3	3687_DEGH	Not a TEC	16.4	16.4	2.9	PCT Cleared - 3%	High Sensitivity to Gain			1.50	0
										Subtotal	**2**
										Total	**2**

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

BAM Credit Summary Report

Proposal Details

Assessment Id
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Proposal Name
Lake Lyell PHES Main Works in the Hill End IBRA subregion

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Assessment Revision
3

BOS entry trigger

Assessment Type
Major Projects

* 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
Central Tableland Granites Grassy Box Woodland												
3	3367_DS	Not a TEC	59.8	59.8	0.71	PCT Cleared - 78%	High Sensitivity to Gain			2.00		21

4	3367_Moderate	Not a TEC	86.1	86.1	5.6	PCT Cleared - 78%	High Sensitivity to Gain			2.00		241
5	3367_Poor	Not a TEC	79.5	79.5	3.9	PCT Cleared - 78%	High Sensitivity to Gain			2.00		156
											Subtotal	**418**
Central Tableland Montane Wet Forest												
1	3211_Moderate	Not a TEC	76.4	76.4	6.8	PCT Cleared - 21%	High Sensitivity to Gain			1.50		195
											Subtotal	**195**
Central Tableland Peppermint Shrub-Grass Forest												
8	3735_High	Not a TEC	93.9	93.9	33.3	PCT Cleared - 69%	High Sensitivity to Gain			1.75		1367
											Subtotal	**1367**
Central Tableland Ranges Peppermint-Gum Grassy Forest												
6	3369_Moderate	Not a TEC	97.6	97.6	24.8	PCT Cleared - 62%	High Sensitivity to Gain			1.75		1061
											Subtotal	**1061**

Goulburn-Lithgow Ranges Silvertop Ash Forest												
7	3650_High	Not a TEC	81.4	81.4	8.6	PCT Cleared - 6%	High Sensitivity to Gain			1.50		261
											Subtotal	**261**
Southern Tableland Creekflat Ribbon Gum Forest												
2	3347_DEGH	Not a TEC	9.1	9.1	0.36	PCT Cleared - 65%	High Sensitivity to Gain			1.75		0
											Subtotal	**0**
Southern Tableland Western Hills Scribbly Gum Forest												
9	3747_High	Not a TEC	89.4	89.4	6.9	PCT Cleared - 65%	High Sensitivity to Gain			1.75		271
9	3747_High	Not a TEC	89.4	89.4	6.9	PCT Cleared - 65%	High Sensitivity to Gain			1.75		271
											Subtotal	**271**
											Total	**3844**

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
Callocephalon fimbriatum / Gang-gang Cockatoo (Fauna)									
3211_Moderate	76.4	76.4	1.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	56
3367_Moderate	86.1	86.1	0.66	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	28
3369_Moderate	97.6	97.6	16.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	793
3650_High	81.4	81.4	3.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	135
3735_High	93.9	93.9	19.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	925
3747_High	89.4	89.4	5.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Endangered	Endangered	False	255

								Subtotal	**2192**
Calyptorhynchus lathami lathami / South-eastern Glossy Black-Cockatoo (Fauna)									
3369_Moderate	97.6	97.6	2.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	114
3735_High	93.9	93.9	1.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	70
3747_High	89.4	89.4	0.27	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	12
								Subtotal	**196**
Myotis macropus / Southern Myotis (Fauna)									
3367_Moderate	86.1	86.1	4.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	211
3367_Poor	79.5	79.5	3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	118
3369_Moderate	97.6	97.6	5.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	250

3735_High	93.9	93.9	11.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	537
3747_High	89.4	89.4	1.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	59
								Subtotal	**1175**
Ninox strenua / Powerful Owl (Fauna)									
3211_Moderate	76.4	76.4	6.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	261
3367_Moderate	86.1	86.1	0.72	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	31
3367_Poor	79.5	79.5	3.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	136
3369_Moderate	97.6	97.6	24.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1208

3650_High	81.4	81.4	8.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	349
3735_High	93.9	93.9	32.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1544
3747_High	89.4	89.4	6.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	310
								Subtotal	**3839**
Paralucia spinifera / Purple Copper Butterfly, Bathurst Copper Butterfly (Fauna)									
3367_Moderate	86.1	86.1	0.54	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	23
3369_Moderate	97.6	97.6	2.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	144
3650_High	81.4	81.4	0.26	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	11

3735_High	93.9	93.9	2.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	129
3747_High	89.4	89.4	1.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	84
								Subtotal	**391**
Phascolarctos cinereus / Koala (Fauna)									
3211_Moderate	76.4	76.4	6.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	261
3367_Moderate	86.1	86.1	5.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	241
3367_Poor	79.5	79.5	3.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	156

3369_Moderate	97.6	97.6	24.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1212
3650_High	81.4	81.4	8.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	349
3735_High	93.9	93.9	33.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1562
3747_High	89.4	89.4	6.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	310
								Subtotal	**4091**
Tyto tenebricosa / Sooty Owl (Fauna)									
3211_Moderate	76.4	76.4	6.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	391

3369_Moderate	97.6	97.6	24.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	1812
3650_High	81.4	81.4	8.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	523
3735_High	93.9	93.9	32.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	True	2317
								Subtotal	**5043**



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